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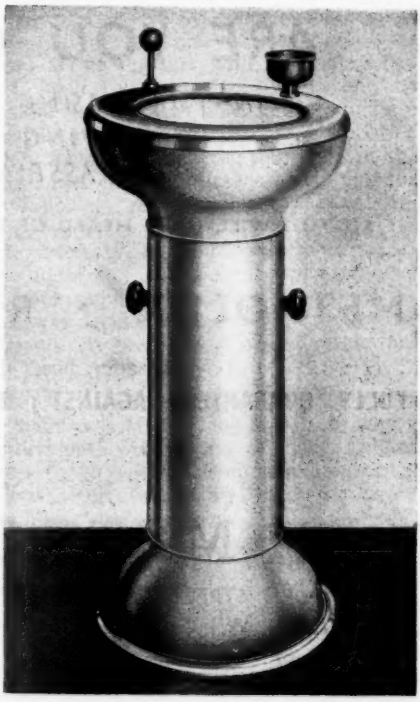

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# BRITISH DENTAL JOURNAL

*The Journal of the British Dental Association*

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## ORIGINAL COMMUNICATIONS

### THE ROLE OF SALIVARY AMMONIA IN DENTAL CARIES


BY G. NEIL JENKINS, M.SC.LPOOL, PH.D.CANTAB.,
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PART I

#### INTRODUCTION

AMONGST the first to suggest that salivary ammonia might be related to dental caries were Grove and Grove [1,2] in 1934. They put forward this claim on the basis of estimations—by the Folin " Permutit " method—of the ammonia concentrations in salivas from both caries-active and caries-free subjects, from which they concluded that there was a higher concentration of ammonia in salivas from the latter group. White and Bunting [3,4] and Youngberg [5] were unable to confirm this observation, and Karshan [6] produced evidence for a small difference—which was not statistically significant—in the opposite direction from that reported by Grove and Grove.

The possibility that salivary ammonia plays a part in freedom from caries was reopened by Kesel, O'Donnell, Kirch and Wach in 1946 [7, 8, 9]. These workers stated that if saliva from caries-free subjects is incubated, either alone or with beef broth, for periods up to eight days, and then Seitz filtered, the filtrates contain a substance which inhibits acid-producing organisms in fresh saliva. The inhibition was demonstrated by a comparison of the pH changes and *Lactobacillus acidophilus* counts in mixtures of glucose, fresh saliva (or pure cultures of *Lactobacillus acidophilus*) and the Seitz filtrates of incubated saliva from either caries-free or caries-active subjects.

Fractionation of the filtrates led to the conclucion that ammonia was the inhibitory agent, but it was not made clear whether the ammonium radicle or free ammonia was the active agent. No figures appear to have been published of the number of subjects, number of tests or actual ammonia concentrations reached during the incubations, but it is stated that, "Non-inhibiting filtrates contained little or no ammonia nitrogen ; filtrates that were inhibitory contained at least 0·5 mg. ammonia nitrogen per ml." For such estimations, Kesel *et al.* used the Folin Permutit method of estimation.

These workers imply that bacterial production of high concentrations of ammonia occurs in the plaques in caries-free mouths and is responsible for the inhibition of acid-producing organisms. They quote experimental evidence that the presence of *Bacterium lactis aerogenes* acting together with an unidentified Gram + bacillus in caries-free mouths may be responsible for this high ammonia production.

Ludwick and Fosdick [10] have reported that they have estimated the ammonia in the dental plaques of a thousand subjects and the results failed to reveal any correlation with caries activity.

In view of the great importance of understanding the nature of the natural freedom from caries which a small percentage of the population enjoy, it was decided to repeat and extend these experiments. A brief report of our results has already been published [11].

#### EXPERIMENTAL

*The Subjects.*—After a long search, 12 caries-free individuals were found of ages ranging from 15 to 29 years. Complete absence of cavities was the criterion by which the caries-free subjects were chosen. Four subjects, claiming to be caries-free, were found to have one or two small cavities and were considered as a separate " caries-low " group. The " caries-active " group had either several untreated cavities or numerous fillings of which at least one or two were recent.

*Methods.*—Saliva stimulated by chewing paraffin-wax was collected into sterile bottles and after shaking thoroughly 1 ml. was added to 10 ml. of beef broth (pH 7·6). In a few experiments 0·1 ml. of saliva was added to 10 ml. of broth. The tubes were plugged with cotton-wool and incubated undisturbed at 37° C. for eight days—except in two experiments in which samples were withdrawn, with sterile precautions at intervals during the eight days. Each batch contained samples collected simultaneously from caries-active and caries-free subjects. Ammonia estimations were carried out by the Conway micro-diffusion method [12].

## Results

(*a*) *Ammonia Production in Mixtures of Broth and Saliva.*—The averages and ranges of the ammonia concentrations of the broths after incubation for eight days with 1/10 vol. of saliva are presented in Table I. It is clear that there is no significant difference between the ammonia levels present in the broths of any of the three groups. Although the range was wide, all the salivas produced concentrations of ammonia higher than the level (50 mg./100 ml.) which Kesel *et al.* state is necessary to produce inhibition and which they found was formed only in broths incubated with saliva from caries-free subjects.

TABLE I

Average ammonia concentration (mg. per 100 ml.) of salivas incubated for eight days at 37° C. *with* beef broth

| | *No. of subjects* | *No. of samples* | *Average $NH_3$* | *Range of $NH_3$* |
|---|---|---|---|---|
| Caries-active ... | 21 | 43 | 122 | 70–200 |
| „ free ... | 12 | 34 | 132 | 70–200 |
| „ low ... | 4 | 8 | 130 | 85–160 |

Some of the samples of saliva were incubated without broth in the bottles—lightly stoppered—into which the saliva was collected. The final ammonia concentrations after eight days incubation are given in Table II and show that more ammonia was produced in the caries-active saliva. This difference was highly significant ($t = 3·3$ ; for at $p = 0·05$, $t = 2·0$).

TABLE II

Average ammonia concentration (mg. per 100 ml.) of salivas incubated for eight days at 37° C. *without* broth

| | *No. of subjects* | *No. of samples* | *Average $NH_3$* |
|---|---|---|---|
| Caries-active ... ... | 10 | 18 | 56 |
| „ free ... ... | 11 | 23 | 36 |

Kesel *et al.* state towards the end of their paper [7] that the inhibitory powers of beef broth-saliva mixtures were greatest when they were buffered with alkaline phosphates of unspecified strength. In experiments to be reported later we found that buffers have a profound influence on the lactate production by salivary organisms. Therefore any possible inhibitory power of incubated buffered broth would be difficult to assess since the effect of the buffer would tend to be confused with that of any inhibitor. We have tested the effect upon ammonia production of the addition of sodium phosphate buffer at a final concentration of 2 per cent and at pH of 7·6. The results in Table III show that the presence of the buffer has no great or consistent influence on ammonia production in broths incubated with either caries-active or caries-free saliva.

TABLE III

Effect of addition of phosphate buffer (final concentration 2 per cent) at pH 7·6 on average ammonia concentration of salivas incubated for eight days at 37° C. *with* broth.

| | *No. of samples* | *Av. $NH_3$ with buffer* | *Av. $NH_3$ without buffer* |
|---|---|---|---|
| Caries-active ... ... | 3 | 155 | 135 |
| „ free ... ... | 5 | 130 | 142 |

*Possible Reasons for the Difference Between Our Findings and Those of Kesel* et al.—The conclusion to be drawn from these results differed so markedly from the reports of the American workers that it was at first suspected that some major difference in technique might be responsible.

One conceivable cause of the discrepancy was that while Kesel *et al.* used the Permutit method of estimating ammonia, we adopted Conway's micro-diffusion method which we found more readily adaptable to our materials. In one experiment the ammonia of the broths was estimated by both methods, and agreement was satisfactory. This experiment eliminates the possibility that an artefact in the ammonia estimations was responsible for the difference in results.

Secondly, Kesel *et al.* did not state how much saliva they added to the broths prior to incubation, and it seemed possible that the 1 : 10 ratio used arbitrarily in our experiments did not favour different rates of ammonia production in the two types of saliva. A few experiments were carried out in which 0·1 ml. of thoroughly mixed saliva was added to 10 ml. of beef broth, and the ammonia production compared with that of a tube containing the same saliva in the usual proportion of 1 : 10. The figures are listed in Table IV which shows that varying

TABLE IV

Average ammonia concentration (mg. per 100 ml.) of broth incubated for eight days at 37° C. with

| | *No. of samples* | *1/10th vol. of saliva* | *1/100th vol. of saliva* |
|---|---|---|---|
| Caries-active ... ... | 4 | 120 | 132 |
| „ free ... ... | 8 | 140 | 145 |

the proportion of saliva to broth has no significant effect on the ammonia concentration reached.

Thirdly, there is the possible loss of ammonia from the medium, which remains alkaline, during the incubation (the pH varied between 7·22 and 8·88). Kesel *et al.* do not mention any precautions to prevent such a loss, but it was thought that over a period as long as a week at a pH of about 8·0, some loss might occur.

The final pHs of many of the broths were determined (using the Bench type of pH meter of the Cambridge Instrument Co.) and the averages for each group were found to be identical at 8·00. While this result might imply that losses of ammonia were equal in both groups, it could equally well be explained by supposing that one group had in the early stages of the eight days' incubation, contained a higher ammonia concentration—with a higher pH—but had lost it in the later stages, till finally both pH and ammonia in both groups became identical. That this latter explanation is untenable is shown by two experiments in which ammonia estimations were carried out at intervals during the eight days' incubation of broths with caries-free and caries-active saliva. At no stage was there any evidence of a fall in ammonia concentration during the incubation.

A number of other experiments were performed with a view to investigating the extent of a possible loss of ammonia during incubation, e.g. measuring ammonia production during the incubation of saliva and broth in sealed tubes, and observing the loss of ammonia during the incubation of solutions of ammonium salts buffered at various alkaline pHs. From the results of these experiments it was concluded that loss of ammonia during the incubation cannot be great, and must be similar, from broths containing either caries-active or caries-free saliva. It seems then most unlikely to account for the difference between our results and those of Kesel *et al.*

(*b*) *Effect of Seitz Filtrates of Broth on Fresh Saliva and Glucose.*—One of the methods by which Kesel *et al.* detected the inhibitory powers of incubated salivas and broth-saliva mixtures consisted of adding Seitz filtrates of the incubated material to fresh caries-active saliva and glucose, and recording the pHs developed during forty-eight hours further incubation. In the one experiment which they quote, no fall whatever in pH occurred in the presence of broth incubated for forty-eight hours with caries-free saliva, but a fall from 7·2 to 4·2 was observed with the caries-active broth-saliva filtrate. We have repeated this experiment, and again our findings differ from those of the American workers. In the first place, we have never found any filtrate which *completely* prevented a fall in pH, but they all had some influence in reducing the fall of pH as compared with the control containing saliva and fresh broth. The details and result of one typical experiment are set out in Table V.

TABLE V

Effect of Seitz filtrates of incubated broth-saliva mixtures on pH changes in fresh saliva with 0·26 per cent glucose—results of one typical experiment

*Incubation mixture :*
2 ml. Seitz filtrate (or 2 ml. $H_2O$ in control)
2 ml. fresh caries-active saliva
0·6 ml. 2 per cent glucose.

| | | *pH* | | |
|---|---|---|---|---|
| | | 0 *hours* | 5 *hours* | 24 *hours* |
| Caries-free subjects | ...(1) ... | 7·52 | 5·47 | 5·39 |
| | ...(2) ... | 7·71 | 7·02 | 5·60 |
| | ...(3) ... | 7·90 | 5·87 | 5·33 |
| | Average | 7·71 | 5·79 | 5·44 |
| Caries-active subjects | ...(1) ... | 7·57 | 7·30 | 5·86 |
| | ...(2) ... | 8·10 | 6·25 | 5·26 |
| | ...(3) ... | 7·60 | 5·74 | 5·37 |
| | Average | 7·76 | 6·43 | 5·50 |
| $H_2O$ control | ... ... | 7·24 | 5·74 | 4·97 |

The average pHs observed after adding caries-active or caries-free filtrates to fresh saliva and glucose are shown in Table VI. The average pH changes in control tubes containing either fresh unincubated broth or water in place of incubated filtrates are also included in this table. It is clear that the Seitz filtrates of both types of incubated broth produce almost identical results, i.e. both reduce the fall of pH as compared with that occurring in the controls.

Kesel *et al.* used a concentration of glucose of approximately 0·28 per cent in their incubation experiments. Since this is below the optimum substrate concentration found by Volker and Pinkerton [13] for salivary acid production, and our own unpublished results adequately confirm this view, we decided to use approximately ten times this concentration.

We have on some occasions set up duplicate tubes on each of the Seitz filtrates and saliva, one with glucose at the final concentration of 2·6 per cent the other at 0·26 per cent. Although the pHs were all consistently lower with the greater concentrations of glucose, we have observed no difference in the behaviour of " caries-free " or " caries-active " broths at either level. This is illustrated in Table V which shows the results of a typical experiment using 0·26 per cent glucose (note the final pH in the water control at 4·97) and Table VI which lists the averages of all the results obtained, the figures referring to experiments with 2·6

per cent (water control reading 4·11 at twenty-four hours). With the lower concentration we have sometimes found that the pH tends to rise towards the end of the experiment, presumably due to the exhaustion of glucose and the unopposed effect of ammonia production. Since this might suggest a spurious " inhibition," we thought it better to have present an excess of glucose.

TABLE VI

Mean of results of all experiments with higher (2·6 per cent) concentration of glucose

*Incubation mixture :* as in Table V except that final concentration of glucose was 2·6 per cent.

| | *No. of expts.* | *pH* 0 *hours* | 4 *hours* | 24 *hours* |
|---|---|---|---|---|
| Caries-active ... | 27 | 7·72 | 6·21 | 4·87 |
| „ free... ... | 30 | 7·70 | 6·19 | 4·95 |
| $H_2O$ control ... | 13 | 7·61 | 5·45 | 4·11 |
| Broth control ... | 11 | 7·75 | 5·27 | 4·09 |

It is, in our view, surprising that Kesel *et al.* found that the pHs of their incubation mixtures continued to fall between the twenty-fourth and forty-eighth hour. We would have expected the glucose at the concentration they used to be exhausted within the first twenty-four hours.

It is obvious that reduction in the fall of pH does not necessarily represent a true inhibition of acid production, but would also occur if the incubated broths were more heavily buffered than the control materials. In an attempt to determine the nature of this arrest in the fall of pH, comparisons were made of the lactic-acid production—determined by the method of Friedemann and Graeser [14]—and pH changes of mixtures of Seitz filtrates of incubated broths and fresh saliva. The buffering power of the filtrates was also measured by plotting the pH following the addition of small volumes of 1 per cent lactic acid.

These experiments showed that less lactic acid was in fact formed in the presence of most of the filtrates as compared with the control tube containing fresh unincubated broth and saliva. The amount formed varied with the different samples but bore no relation to the state of caries activity of the subject whose saliva was originally used to prepare the filtrate. It was clear from the titration curves that the buffering power of the broth increased markedly during the eight days incubation but that the increase was approximately the same in all samples.

Finally the true antibacterial powers of twenty filtrates were studied by placing drops of the filtrates in " wells " cut into agar plates containing mixed salivary organisms, and incubated for three days. These tests showed that most of the filtrates had no perceptible inhibitory power, although two did show some weak inhibition. It is of interest that one of these was from a caries-active, and the other from a free subject. The significance of these results will be discussed later.

Earlier, reference was made to a number of experiments in which the saliva-broth medium was buffered with phosphate buffer prior to incubation for the eight days. These samples were also Seitz filtered and their inhibitory actions tested. As expected, the lactic-acid production was actually increased over the control in most cases. In these specimens the " well " technique in agar plates also showed little or no evidence of inhibition.

## Discussion

We are unable to explain why Kesel *et al.* found that saliva from caries-free subjects produced more ammonia on incubation than did samples collected from people who were caries-active. As already mentioned the real difference between the present results on ammonia productions and those of the American workers lies in the behaviour of the saliva from the respective caries-active subjects. We agree with Kesel *et al.* that caries-free salivas produced, in the conditions studied, more than 50 mg. of ammonia per 100 ml. We find, however, that the caries-active salivas produce similar concentrations. If a difference really exists between the ammonia producing activities of the two types of saliva, we feel that it should have been apparent in our experiments. 37 subjects—including 12 free from caries—have been tested, mostly several times and under a variety of conditions, with precautions to check on loss of ammonia during incubation, yet the caries-active salivas all produced an ammonia concentration above the level (50 mg. per 100 ml.) which Kesel *et al.* state is reached only by caries-free salivas. In no broth or saliva incubations whatever have we found " little or no ammonia " as Kesel *et al.* state was present in broths incubated with caries-active salivas.

Our results are consistent with those of Ludwick and Fosdick [10] who found no difference between the ammonia content of plaques from caries-active and caries-free mouths.

While it is still just possible that differences in technique might account for the discrepancy between the two sets of results on broth incubations, this can hardly explain our findings with saliva incubated alone. No technique was involved in these experiments other than the collection of saliva in sterile tubes, its incubation for a week and the ammonia estimations.

The figures in Table II show significantly greater ammonia production from the salivas of the caries-active group. We think that this difference may indicate that many types of bacteria—in addition to acid producers—are more numerous in caries-active than in caries-free mouths.

Although it is difficult to say for certain from the chemical evidence whether or not the incubated broths contained any substance inhibitory to bacteria, it is quite obvious that our experiments provide no support whatever for the view that only caries-free salivas produce such an inhibitor. Since the buffering power of the various broth filtrates increased fairly uniformly, the difference in lactic acid produced during the incubation of the filtrates with fresh saliva, cannot be explained on a basis of variation in buffering power. These experiments do not, however, necessarily indicate the presence of a true inhibitor since the nutritive value of broths, after eight days' incubation with different samples of saliva, might be expected to vary considerably and would promote the production of different amounts of acid.

The tests on agar plates, although limited to twenty filtrates, suggested that no true inhibitor was consistently present in caries-free filtrates but that occasionally an inhibitor was developed even in broths incubated with caries-active saliva. We realise that many more tests of this type would be required—using a variety of test organisms in pure culture rather than mixed salivary flora—to decide for certain whether inhibitory substances are formed during the incubation of saliva with broth. In any case it is hardly surprising that some of the end-products of bacterial metabolism might be inhibitory to other—or even the same—organisms.

It must be emphasised that the anti-bacterial tests described in this paper refer only to saliva which has been incubated for eight days with broth, and throw no light on any possible anti-bacterial substances present in fresh saliva as suggested by Hill [15] and Bibby *et al.* [16]. It will also be noted that we have not as yet carried out bacteriological tests on saliva incubated without broth.

In view of our results, we are unable to accept the theory of Kesel *et al.* that the production of ammonia by salivary bacteria is related to freedom from caries, but cannot explain why our observations differ so completely from theirs.

Other aspects of the work of Kesel *et al.* on the relation of ammonia to dental caries are to be considered in a later communication.


## Summary

(1) The experiments of Kesel *et al.* on the production of ammonia by salivary bacteria during eight days' incubation either alone or with beef broth, have been repeated.

(2) No difference has been found between the concentration of ammonia produced by saliva from caries-active or caries-free subjects. All the samples produced an ammonia concentration similar to that which Kesel *et al.* state is produced only by caries-free subjects.

(3) The Seitz filtrates of broth-saliva incubation mixtures were found to become more highly buffered during incubation. When added to fresh saliva and glucose, they all reduced the fall in pH which occurs on incubating for twenty-four hours compared with controls using saliva, glucose and water or saliva, glucose and fresh broth.

(4) No inhibitory power was detected in 18 out of 20 broths which were incubated on agar plates with mixed salivary organisms.



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We wish to acknowledge our indebtedness to Professor R. W. Lovel and Mr. G. E. M. Hallett of the Newcastle-upon-Tyne Dental Hospital for putting us in touch with some of the caries-free subjects and for conducting mirror and probe examinations on others. We also wish to thank Miss Joan Dodds for skilled technical assistance. Finally we are grateful to the Committee of the King's College Research Fund for financial support.


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# DENTAL FACTS AND FANTASIES[1]

By ALEXANDER MacGREGOR, M.A., M.D., F.D.S. R.C.S.Eng.

It is said of medicine that it remains an art and has not yet reached the status of a science. This, of course, applies with equal justification to dental surgery, which is but a branch of medicine. Much of the treatment that we prescribe or carry out ourselves is empirical. Much has been handed down by tradition without any very good evidence underlying it, and much that has been superseded or shown to be fallacious still lingers on.

The purpose of this paper is to inquire into some of the treatment that we mete out to our patients and to see whether in some cases we can support it with the backing of experimental evidence, or if in some cases we should discard it where the evidence is inconclusive, or even in opposition to our treatment. I have deliberately chosen certain aspects of dental surgery for discussion though there are many to which the above remarks could apply. Many practitioners are bound to disagree with some of the conclusions reached and quite clearly in the writer's case lack of conviction in the merit of a particular form of treatment, unfortunately, does not imply in many cases that he can suggest anything better. The one merit of provocation is that it stimulates thought. Perhaps, therefore, if we are sufficiently provoked we may find ourselves slightly nearer some of the answers that we seek.

## Drugs

Numerous drugs continue to be used in dental surgery though in many cases they have been shown to be definitely harmful and in others they are used in forms or concentrations which have been shown to be ineffective. Phenol and cresol types of antiseptic are no longer employed, save in rare instances, in general surgery for disinfecting live tissues, since in weak solution they are comparatively ineffectual and in higher concentration cause death of the tissues. In spite of this, weak solutions of carbolic are still employed at dental teaching hospitals for the immersion of mouth mirrors, etc. One frequently sees students, after employing a mirror on one patient, give it a dip in a solution of carbolic which is too weak to have any effective action in the time, and, after wiping it, employing it on the next patient. From the practical point of view, this type of procedure may not matter much but it is bad training for the student to allow him to think that he is in any way disinfecting the mirror. At the other end of the scale tricresol is still employed for the treatment of root canals. If this extremely caustic agent does not penetrate as far as the apex, which of course it is supposed to do in order to sterilise the canal, all is probably well. If, however, it reaches the apex and seeps through, bone is destroyed in the periapical region. When the effect of the tricresol has worn off an area of dead bone remains which is extremely likely to become infected at a later date.

It was first, I think, shown by Fleming that acriflavine tended to be absorbed on to wool or gauze dressings and when employed with these materials it was mainly water that reached the tissues, the dressings being impregnated with the dye. Acriflavine and paraffin emulsions are also frequently employed. Here again, it is improbable that they can be effective from the antiseptic point of view since the paraffin forms an oily film at the surface of the tissues, thereby preventing the contact of the acriflavine with them. Iodoform is still employed for packing into septic sockets, usually in the form of BIPP paste. Iodoform has long been discarded in general surgery as being ineffective, though possibly its pungent smell may have a psychological effect upon the patient. Arsenic is still employed for devitalising teeth. Here again, however, if traces of arsenic travel through the apical foramen death of surrounding bone is caused, with a possibility of later infection as in the case of tricresol.

There are numerous drugs that could be mentioned. Those quoted merely represent a few that are still in use though the evidence in their favour is sadly lacking, and the evidence against them in many cases is unpleasantly strong. Has not the time come to delete some of them from our armamentarium?

## Dental Caries

In the treatment of dental caries it has long been one of the primary principles that the cavity when finished by the operator should show clean hard dentine all round. This cleanliness to the naked eye must be more apparent than real, since burs and excavators travelling through carious tissue heavily contaminated must implant organisms all round the cavity. The more live tubules that are opened up the more widely are organisms implanted in the

[1] Read at the Annual Meeting of the British Dental Association, Birmingham, July 13, 1950.

open ends of these tubules. When we have finished a cavity, therefore, though it may look clean, from the bacteriological point of view it must still be heavily infected and, in fact, more new tissue is potentially infected than before. The success of a filling can scarcely depend, in consequence, upon our having obtained a sterile cavity and we must look to other factors such as changing the conditions at the bottom of the cavity inhibiting the growth of organisms, etc., in explanation of our success in halting the process.

Recent teaching has tended towards leaving carious tissue over the pulp where no signs of pulpitis are present but where removal of this tissue might possibly lead to exposure. Fillings put in under such conditions, where there is no previous pulpitis and no undue pressure from the filling, etc., are usually entirely successful, yet soft caries has been left under the filling directly over the pulp. The probable explanation of the lack of subsequent trouble lies in the dead tracts and translucent zones underlying the carious process and walling it off from the pulp, described many years ago by Fish. If we can leave soft caries over the pulp in so many cases with impunity why do we struggle so manfully to remove all caries from elsewhere at the bottom of the cavity? Providing that the edges are clean, so that there is an exact fit of filling with enamel to prevent ingress, and providing that the floor is sufficiently sound to form a suitable foundation for the filling, surely in view of the foregoing facts we are deriving no advantage from so scrupulously removing every particle of carious tissue within the cavity. How many of us, I wonder, have seen pulpitis ensue in teeth with no leak round the edge of a filling where the filling of a non-irritant nature has been placed over soft caries left in the depths. I cannot myself recall having seen a case where trouble has occurred save where there were symptoms of pulpitis prior to the insertion of the filling.

## Gingivitis

It is, of course, quite clear that since our gums, in common with all the oral tissues, are continually subjected to a barrage of pathological organisms, resistance must be extremely high and that this resistance in turn depends upon a very efficient blood supply. It is a significant fact that the most marked predisposing factors tending towards the development of acute gingivitis are those causing an interference with the quality or quantity of the local blood supply. Thus, the association of acute gingivitis with the leukæmias, with diseases causing leucopenia, or agranulocytosis, e.g. glandular fever, etc., and in the conditions where the normal blood supply is interfered with by the presence of particles of metal, etc., e.g. lead, bismuth, is well known. The gums are, in fact, an excellent indicator of the state of the blood, since where freedom from infection depends almost entirely upon the blood supply the gingival tissues will be among the first to show the effects. The main factor in the normal way in keeping up this blood supply is probably masticatory friction. Disuse of a limb quickly leads to lack of tone in the muscles and it would appear probable that lack of masticatory friction equally results in a decrease in the efficiency of the local blood supply.

Numerous subdivisions of gingivitis have been made. The fact remains, however, that sections of tissue taken from differing clinical types show very much the same type of picture, though naturally in differing degrees. Thus, a section taken from a patient suffering from acute ulcerative gingivo-stomatitis shows a more severe local inflammatory reaction than a patient with a chronic gingivitis. Yet, smears taken from pockets of a chronic gingivitis show numerous spirochætes and fusiform bacilli. It would appear, in consequence, that many of these subdivisions of gingivitis are purely artificial and that the main predisposing cause of the disease is lack of local resistance due to interference with the blood supply, lack of masticatory friction being the primary factor. Every effort should, therefore, be made to encourage patients to chew food which is likely to produce this result, and to employ gum massage, in addition to using wood points or other suitable weapons to clean and massage their interdental spaces. The design of partial dentures to avoid covering the gum margins as far as possible is, of course, of great importance and the flabby toneless gum so often seen beneath large acrylic or vulcanite dentures is an excellent example of the result of lack of the necessary friction.

## Full Dentures

We still continue to use posterior teeth with cusps and to use specialised articulators which presume to imitate the movements of the temporomandibular joint, and to talk happily of three-point occlusion and so on. Bitter experience in cases where the ridges are not well marked has led us to place less faith in the theoretical balance to be obtained between the cusps and to grind most of them off. I have advocated elsewhere the employment of flat molar blocks with ridges cut in opposite direc-

tions in the upper and lower blocks, to overcome the difficulty of cusp interference. Why do we so resolutely, and I would suggest obstinately, stick to anatomical shape for the posterior teeth where function is the most important factor, and yet function is so often diminished by the presence of these very cusps?

### Actinomycosis

I have included this condition since certain factors in the disease do not as yet appear to be generally appreciated. The disease in man is due to the Wolff-Israel strain which differs morphologically and serologically from *A. bovis*, the strain found in cattle. It is also different from the strains found on grass, which are aerobic and not anaerobic. In addition, it has been shown by numerous observers that the organism is present in the normal human mouth. Alas, therefore, we must bid farewell to the old, old story of the yokel chewing grass, or the cowman tending his cattle as being the likely sufferers. We are all potential sufferers from the disease though the method of ingress of organisms otherwise living quietly in the mouth remains obscure. It is fortunate that in penicillin we have such an excellent weapon against the disease.

Many of the above facts are, of course, well known: some of them are open to many interpretations. Our judgment upon many of the issues involved is liable to be influenced by many factors. The more critical we become, and I am sure, and may say hope, that this paper will come in for a good deal of criticism, the more likely we are perhaps to sweep out of the way some of the inhibiting dogma of tradition and to base our treatment upon more sure foundations.

### Discussion

Mr. W. Moodie said that iodoform had been used in all branches of surgery for nearly eighty years. It was first introduced as a routine treatment into the Lister wards by Lister's successor at the Royal Infirmary about 1880. Many dentists had tried to find a substitute for it for certain branches of their dental work, and had tried acriflavine, penicillin and various other preparations, but had come back to iodoform and bismuth paste because its mechanical action in keeping the cavities open and reasonably clean was satisfactory. It would be interesting to hear what substitute or improvements Dr. MacGregor could suggest.

With regard to the flat molar blocks, those who had studied articulation would find this principle hard to accept at first glance.

Dr. MacGregor, dealing with the use of iodoform packs, said that for wound cavities, he preferred Tulle Gras. This was more pleasant for patients and did not interfere with healing, It could be squeezed in and the excess wax wiped off, and when removed the waxy nature of the base did not entail the same degree of pain and discomfort to the patient. The action of antiseptics deteriorated fairly rapidly. Iodoform had largely been given up in general surgery, and he personally had not found it of much value, save on rare occasions for the psychological value of its pungent smell.

With regard to occlusion of teeth, when one had been conditioned by teaching, to the realisation of the importance of three point occlusion, it was difficult, possibly, to contemplate the use of flat molar blocks with equanimity. For patients with good high ridges, cusped teeth, quite clearly, could be used; but the flat blocks were advocated for the more difficult mouth, particularly where there was a continual tendency to dislodge the lower denture.

Mr. B. Cooke asked what Dr. MacGregor understood by a clean tooth, and whether a lot of oral hygiene was possibly harmful if it removed or otherwise interfered with the metabolic defences of the individual.

Dr. MacGregor said that he was not quite sure what was meant by a " clean tooth " in the mouth. Clearly it was not sterile, and the term was difficult to define. All that could be said was that it was a tooth which appeared sound and normal to the naked eye. He was not sure that all this cleaning of teeth with brushes had not become a fetish, and there was in fact, little real evidence that much good was done as far as prevention of dental caries was concerned. He confessed that his own two children aged eleven and nine, were not encouraged to clean their teeth with brushes and paste, and so far they had no caries, though doubtless they would acquire it later. This clearly was not evidence of anything other than the fact that failure to brush the teeth did not at once result in rapid caries as was sometimes suggested. If one did a small experiment in getting a patient to chew a biscuit containing carmine particles and thereafter to use a tooth brush and paste, it was remarkable how much of the carmine could be obtained from the interstices between the teeth after this brushing. In the ordinary way, movements of the cheeks cleaned the teeth on their buccal sides, and movements of the tongue cleaned the lingual sides. The tooth brush worked over these two faces and also on the occlusal aspect, but was inefficient at getting anything out between the teeth. In his opinion it was more important that the diet should be correct, and particularly that a child should end a meal, as far as possible, with some form of fibrous food, particularly last thing at night. The main danger, in his opinion, was the reliance that was placed on the tooth brush, as the idea was current, that if a child finished a meal with a biscuit for example that it had only to use a tooth brush to remove it all. This was untrue, and therein lay the danger.

Mr. A. Mack said a question very often asked in the surgery was " What is the best tooth-paste ? " His invariable answer was " It depends what flavour you like." He would like to emphasise the dangers of tooth cleaning. Years ago, at the Royal Dental Hospital, the elder Mr. Steadman saw a very nice girl, seventeen years of age, with a beautiful mouth, and said to her " How

do you keep your teeth so clean?" She replied "I never use a tooth brush; I have not cleaned my teeth at all." He told her to get a tooth brush and paste and look after her beautiful mouth. Some months later a pallid girl, obviously ill, presented herself again for treatment. Her mouth was in an appalling state, and he asked her what she had been doing. She said "I took your advice, sir; I got a tooth brush and I have been cleaning my teeth." On further inquiry it appeared that her young brother thought that the tooth brush would be an admirable instrument for cleaning the hub of his bicycle with some Bluebell metal polish, and she had then continued to use that communal tooth brush.

Mr. S. L. DRUMMOND-JACKSON asked, if the occlusal cusps were eliminated, why retain the buccal contour, which merely formed a triangular food retention area with the cheek at rest.

He thought the loose handling of modified cavity preparation dangerous. Nowadays there would be an appreciable tendency for busy dentists to snatch at such a technique as had been suggested, and the less conscientious could well stick up Mr. MacGregor's paper in front of any questioning person and say "I sincerely believe that decay should be left in cavities." Dr. MacGregor had indeed taken on much responsibility. Any such technique must be meticulously qualified and not handled in such a loose way.

Dr. MacGregor's reply regarding tooth-brushing appeared to be similarly loose. Perhaps Dr. MacGregor would say what he would advise a patient to do who had a finely fitted skeleton plate with bands which had been carefully surveyed and burnished inside. If the patient did not clean inside these bands he would undoubtedly soon have decay.

Dr. MACGREGOR in reply said that the buccal contouring was done from the cosmetic point of view, so that a patient could smile widely and even from a lateral view still appear to have normal teeth.

If a patient was confined to bed for a considerable time, the leg muscles started to waste and tone was lost. In the same way, if there was insufficient friction on the gums, it was likely that they would become flaccid with loss of tone. Civilized diet at the moment was largely more suited for dentures than for natural teeth, and in consequence the gums did not receive an adequate amount of stimulation. It was, of course, practically impossible in these days, to return to a rougher and more frictional type of diet, and we had to make up for this loss of stimulation in other ways. Too many people merely swallowed instead of chewing vigorously, and they should be encouraged to use their jaws for chewing as far as possible. This could be supplemented by gum massage with the fingers and a tooth brush of the right consistency.

He agreed with Mr. Drummond-Jackson's views on the dangers that might ensue if statements he had made about leaving caries were misapplied, and used as an excuse for poor work. He did not think that they would be misapplied in this way, as when speaking at the Annual Meeting of the Association he was addressing not students, but practitioners of considerable experience. He was putting forward suggestions on matters which clearly required further thought. Was it possible to argue that caries could be left over the pulp, where exposure might otherwise result from its removal, and a filling be inserted, as was even taught to students in many teaching hospitals at the moment; and at the same time to suggest that it was criminal to leave caries elsewhere at the bottom of the cavity. The edges of the cavity must of course be completely clean and he was insistent on this. Many teeth, however, with caries over the pulp were now treated by leaving it in place without apparent ill results, and he could not agree that the mere leaving of caries in the depths of the cavity, provided the edges were clean and the teeth soundly filled, was of itself a heinous crime.

As far as cleaning the teeth where a denture was present was concerned, he felt that he and the questioner might be at cross purposes. He had assumed that a patient with a denture took out the denture to clean it, and did not brush the teeth with the denture in place.

Replying to a member who asked what he would suggest in place of tricresol as a satisfactory disinfectant for septic conditions Dr. MACGREGOR said personally he used hygroscopic material with penicillin as an adjuvant. He was not sure that the penicillin itself was of great value; the major principle being that the hygroscopic material would draw fluid out and encourage flow of tissue fluid and leucocytes—a generally accepted principle in the treatment of any septic wound.

Dr. N. DORDI asked what Dr. MacGregor had to say about the use of carbolic for sterilising instruments, and what alternative he would recommend. He also asked whether Dr. MacGregor recommended plastic or porcelain teeth for dentures, and what type of hard food he recommended to be eaten before going to bed. In India, Dr. Dordi said; the last dish was a sweet dish, and unless the teeth were brushed before going to bed he did not see how the mouth could be maintained clean. Efforts were made in India to get the children to eat sugar cane, which kept the mouth very clean.

Dr. MACGREGOR said that strong carbolic acid was a caustic and he could see little indication for its use in the mouth. A carbolic solution weak enough to be used in the mouth was of little value as a mouth wash. For the sterilisation of instruments there were many alternatives to carbolic, apart of course from boiling or other forms of heat. Alcohol was used, but it took a considerable time to sterilise instruments in alcohol, and experiments undertaken with syringes, showed that it was still possible to culture organisms where small airlocks existed around the syringe after some days.

With regard to the question of whether acrylic or porcelain teeth should be used. He thought there was little question about the advantages of acrylic resin for anterior teeth, since of course, they were far more pleasing æsthetically. With the posterior blocks which he employed, acrylic resin did not appear to wear down to any great degree, where opposed by other acrylic blocks, and if the ridges required sharpening from time to time it could easily be done.

Mr. KURER expressed agreement with every word Dr. MacGregor had said, and added that it was an illusion to believe that the semi-translucent cements which were advertised for the cementing of jacket crowns

were less toxic than the ordinary silicate cements. It was another illusion to believe that potassium bromide or tincture of valerian were effective with pre-medication of excitable patients. A real sedative like sodium amitol gave much more reliable service.

Mr. G. H. TEALL said that Krauss, had put forward the same principle as had just been stated by Dr. MacGregor, namely to avoid the exposure of the pulp whenever possible and to leave caries, and even soft caries, rather than expose the pulp. Krauss stated that from his researches he had found that if air was perfectly excluded caries did not persist, and it certainly did not increase. He therefore advocated leaving the carious dentine rather than exposing the pulp, and covering it perfectly with cement ; but he emphasised, as Dr. MacGregor had done, that the edges of the cavity should be strong and firm and that the cavity should be sealed perfectly. The exclusion of the air, however, was the main point. Personally, he had practised that method ever since, and had not had any failures to his knowledge.

He would like to bolster up the Sim Wallace principles of Dr. MacGregor. If dentists did not follow the proper procedure themselves, and at their functions, by finishing their meals with foods not made with flour and sugar—fruit, of course, being the best—what chance had they of getting their patients or the public to do so ?

Dr. MACGREGOR remarked that it was difficult to suggest to those who had arranged the excellent dinner on the previous evening, that they had not provided a meal which was adequately exercising and cleaning from the dental point of view. However, he stuck to his principles as far as his own children were concerned and he did feel that everything possible should be done to improve the diet within the limits of gastronomic satisfaction.

As far as leaving soft caries in the depths of the cavity was concerned, it was now standard teaching in some of the larger teaching hospitals that if there were soft caries over the pulp that it might be left. That was not merely his own view, but was being taught elsewhere. A significant point in his mind, was that most dental surgeons had at some time or another taken a chance, and if there had not been previous pulpitis, even if there were some soft caries over the pulp, had put a filling over it. If the edges were sound, with no leak, how many of those present had seen such a tooth go wrong? How many of those present had seen a live tooth, which had been filled for some time give rise to trouble due to a carious process, without a hole being found somewhere round the periphery, giving rise to a leak ?

Mr. R. R. STEPHENS said that on Saturday mornings, at the Royal Dental Hospital, Dr. MacGregor ran a very fine clinic for final year students, and, to make them think, asked them some of the questions which he had been discussing that day.

His difficulty was that he met those students on the Monday morning and was asked, on occasions, to say whether he thought Dr. MacGregor was right or wrong.

He would like to raise the question of tricresol in root canals again. The point seemed to him to be that in the root canal of a tooth there were conditions which were in no way parallel with those in any other part of the body, because leucocytes could not crawl down through the apical foramen and engulf bacteria in the middle of the root canal. It seemed justifiable, therefore, to use strong antiseptics in the root canal, provided that they did not go through the apex. If they did pass through the apex, one might get periapical necrosis, but did a little periapical necrosis matter ? Did it not result in just a cap of fibrous tissue sealing off the apical foramen which might be followed by secondary cementum, and surely that was what one aimed at in root canal therapy, and one of the best results which could be achieved.

Dr. MACGREGOR said that he still could not agree about tricresol. Dentine, in spite of what had been said was a vital tissue, that vitality was destroyed when the pulp was removed. If only a small amount of tricresol permeated through the apical canals, fibrous tissue might later form round the apex, but if it got through in large quantities—and it could not really be controlled, it would kill off the tissues and cause necrosis of bone. Any such area was liable to become infected at a later date, like any other piece of dead tissue, when the action of the tricresol had worn off.

Professor MANLEY said that Dr. MacGregor had stated directly and with considerable force what he himself had been trying to show as gently and tactfully as possible over a period of twenty years. Dr. MacGregor's object had been to make his audience think. This seemingly direct approach had in fact a sound biological and pathological background based on Dr. MacGregor's own work over a considerable period of time. His conclusions therefore should not be considered as being either irresponsible or lightly arrived at. Judging by the discussion Dr. MacGregor had indeed made his audience think and his primary object had been achieved.

A vote of thanks to Dr. MacGregor was carried with acclamation.

## THE USE OF POLYVINYL CHLORIDE IN PROSTHETICS

BY R. TAYLOR HEYLINGS, M.B., CH.B., B.CH.D.LEEDS.

THE construction of obturators in which it was necessary to replace the whole of the maxilla on one side, led to a search for a flexible plastic which could be used in conjunction with acrylic resins, and which would be completely non-irritant to mucous membrane, non-porous, and, if possible, completely stable. After consideration of many of the flexible plastics it was decided to try polyvinyl chloride (using di-butyl pthallate as a plasticiser) as it is a true thermoplastic which:

(i) is resistant to acids, alkalis, oils and water;

(ii) has a wide range of plasticity with low percentage of shrinkage ;

(iii) is obtainable as a moulding powder ;

(iv) is non-inflammable.

The first problem was how to effect a sound union between the acrylic resin part of the obturator, and that part of it which was to be made of the flexible plastic.

Several tests and methods were tried out, and finally it was found that the best method was using steam heat for the processing. The union between the acrylic resin and the polyvinyl chloride was achieved by first packing the acrylic well home and pressing up firmly, and then cutting away the acrylic where it was wished to substitute the p.v.c. This space was filled with a putty made by mixing the polyvinyl chloride powder with a minimum of the plasticiser. Then the flask was closed, after making sure that the packing of the p.v.c. was thoroughly done ; and processing was accomplished by putting the flask into the vulcaniser and raising the temperature to 150° C. and maintaining it at this level for one hour.

On deflasking, the polyvinyl chloride and the acrylic resin had formed a firm union and it was impossible to separate them without tearing through the material. The stability, flexibility and porosity were determined by the amount of plasticiser used in the preparation of the original paste, as well as conditions of processing.

The great difficulty encountered in this use of the p.v.c. was, that when it was desired to make a hollow box obturator, it was impossible to fit a lid to the box, as it is impossible to effect a sound union between either processed p.v.c. and processed acrylic or two pieces of processed p.v.c. It was found that some sort of union could be obtained by sealing the joint between two pieces of p.v.c. with a thick mix of unprocessed paste and then directing a jet of hot nitrogen at a temperature of 150° C. on to the join for a sufficient time to effect gelation. Even this method, however, was not really satisfactory, as it was impossible to maintain much pressure on the joint during the processing, and afterwards the surfaces could be separated fairly easily.

Another use for which a flexible plastic was needed, was the lining of acrylic dentures with a flexible material for the occasional patient who could not tolerate the hard all-acrylic denture. In this case also the qualities required were :

(i) Non-porosity.

(ii) That the substance should be unchanged by oral conditions and maintain its rubbery consistency indefinitely.

(iii) That the finished denture should be æsthetically satisfactory.

It was found that it was possible to get a firm union by processing the layers of p.v.c. and acrylic together in the vulcaniser at 150° C. for one hour.

Here, however, a difficulty was met, as if the acrylic teeth were incorporated at the same time, there was a great danger they would be bleached by the high temperature in the vulcaniser. This difficulty was overcome by processing the soft p.v.c. along with an acrylic base plate, thus ensuring the union. This base plate was then used at the try-in stage of the denture and the teeth added by a normal processing of the acrylic at a temperature of 100° C. for one hour.

Here again the less plasticiser used and the more pressure employed in the pressing-up the less porous was the p.v.c.

By these means a satisfactory soft-lined denture could be produced, although the final trimming and polishing of the soft part of the denture was rather difficult. Experience has shown, however, that over a period of six months, if the denture is worn constantly in the mouth, the rubbery consistency is lost ; the

FIG. 1.—An example of an obturator constructed of polyvinyl chloride and acrylic resin processed together to enable the patient (*a*) to insert the obturator easily, and (*b*) with the idea of the rubbery p.v.c. forming a cushion to absorb the shock of the bite. This made a satisfactory prosthesis well tolerated by the patient (even after some hardening of the p.v.c. had occurred).

plasticiser gradually coming out of the p.v.c. into the oral fluids. It must also be mentioned that in some cases a whitening of the mucous membrane underlying the p.v.c. was noted, and, although this appeared to lead to no harmful effects, the fact that the p.v.c. had some effect, possibly toxic, on the oral tissues must be recorded. This effect must be due to the use of dibutyl-pthallate as plasticiser, as this substance is believed to be slightly toxic. At this point it must be added that if an excess of plasticiser is incorporated in the p.v.c., after processing, it has an unpleasant odour which is remarkably persistent.

Still another use which was found for the p.v.c., was in the preparation of obturators to close (*a*) holes in various parts of the palate, (*b*) openings into the nasal fossa or into the antra, where the amount of undercut was sufficient to prohibit the use of a rigid all-acrylic prosthesis.

### Conclusion

It is possible, using p.v.c., to get a good union of a flexible plastic with acrylic resin. However, if the appliance is for use in the oral cavity, at all times the question of the possible toxicity of the plasticiser must be kept in mind, and the p.v.c. must not be expected to retain its flexibility for much longer than six months; indeed, unless the p.v.c. is processed correctly, with a minimum of plasticiser and under considerable pressure, it must be expected to change its form rapidly and become very unpleasant.

Thus, until a plasticiser has been found which can be guaranteed to be non-toxic, and a method has been discovered of stopping the plasticiser coming out into the oral fluids over a period of time, it is not considered that p.v.c. is a suitable material for general use in the mouth, if the processing is to be kept simple and within the scope of any normally equipped dental laboratory.

### Notes

(1) The above method of processing, using wet heat, is unsatisfactory when using p.v.c. for facial prosthesis such as artificial ears and noses, as the moisture causes discoloration. Dry heat of 141° C. for fifty minutes is the best method for this sort of work.

(2) It is most important that gelation be complete before p.v.c. is used in the mouth, as otherwise, apart from the unpleasant odour and taste, a potentially dangerous amount of the plasticiser may come out into solution in the oral fluids.

### Acknowledgments

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## SHORT COMMUNICATION

## A CASE OF AN EXTENSIVE ADAMANTINOMA OF THE MANDIBLE

By N. SALAMA, L.D.S.Eng., and AZIZ HILMY, L.D.S.Eng.

*Dental School, Cairo.*

A female, Egyptian, aged 25, reported to the Dental School, Cairo, suffering from an extensive growth involving the whole lower right body of the mandible and the ascending ramus and extending up to the left premolar region. The neoplasm was of endosteal origin and was causing expansion of the inner and outer plates of the bone. It had attained an unusual size and was very unsightly. There were many fluctuant cystic areas. Some of these cystic cavities had ruptured inside the mouth and become secondarily infected. Externally, at the lower border of the growth, a large cystic area had also ruptured and there was a gaping sinus which was infected (fig. 1). The expansion of the multiple cystic areas of the growth had caused all the teeth of the affected area to be dislodged. Wassermann

Fig. 1.—Photograph of patient. A large sinus can be seen at the lower border of the neoplasm. This leads into a large cystic cavity.

reaction was negative. The patient's general health was fair. The blood picture was quite normal. Some systemic disturbances were present due to toxic absorption from the infected open cystic cavities.

*Radiographic Appearances.*—The right mandible together with its ascending ramus were extensively expanded and there were numerous cystic areas of different sizes, separated by bony septa, i.e. a typical picture of an adamantinoma (fig. 2).

FIG. 2.—Radiograph of the growth showing severe expansion of bone and numerous cystic areas of different sizes separated by bony septa.

*Microscopical Examination.*—Under the microscope the growth showed a typical picture of a basal-celled carcinoma, containing many cystic cavities of different sizes lined by columnar cells and separated by fibrous and bony tissues (fig. 3).

FIG. 3.—Photomicrograph of the growth showing many different sizes of cystic cavities lined with columnar cells (basal-celled carcinoma).

# EVERYDAY PROCEDURES IN DENTISTRY

## GOLD INLAYS BY THE DIRECT METHOD

BY N. LIVINGSTONE WARD, L.D.S.LPOOL

*London Hospital Dental School*

SINCE the introduction of the gold inlay in 1907, it has been recognised as one of the best methods of restoration in dentistry. It satisfies nearly all the standards required for a filling material, and G. V. Black has written : " Possibly one would be justified in making the statement that the greatest benefit from the gold inlay has been in the prevention of diseases of the peridental structures." This refers to the fact that in using a gold inlay a perfect contact point may be restored giving the best possible protection to the gingivæ.

### CAVITY PREPARATION

The cavity preparation is the most important step in the making of a gold inlay. It can be said in all faith that if the inlay does not fit then look at the cavity. No inlay will fit if there are undercuts or irregularities in the cavity form. All too often the casting technique or the materials are blamed for inlay failure when all the time the fault was in bad cavity preparation. Good cavity preparation is the basis of all good inlay restorations and cavities must be prepared with care and accuracy. The best method to ensure that there are no irregularities and undercuts is to direct every instrument—be it disc, bur, stone, chisel or diamond point—in such a way that it is impossible for them to arise. Deep

extensive caries should be removed and the cavity lined with cement and then re-prepared on the same principle. The finished lined cavity is made up of flat planes and angles, the walls being nearly parallel with not more than 5 degrees divergence so that the angle between the floor and the walls will vary from 90 degrees to 95 degrees. All angles in the cavity form should be sharp, the only curves allowed are in the outline form, and in specialised locks for retention. It is important to remember that the cement lining is part of the cavity and should be just as carefully prepared. Small pieces of cement are apt to break off unnoticed and leave undercuts sufficient to cause distortion of the pattern (fig. 1).

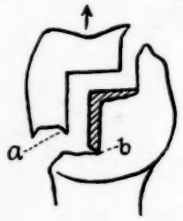


FIG. 1.—(*a*) Vertical distortion due to horizontal fault (*b*).

The various types of cavity preparation depend largely upon the individual case but they should all be based on Black's principles. The various steps—outline form, retention and resistance forms, convenience form, removal of caries, enamel walls and toilet—should be performed individually and in that order, except that in certain circumstances the caries is removed before the outline form has been obtained. The minimum amount of tooth tissue should be removed compatible with the stresses and strains set up on mastication, and the margins should be extended to prevent further decay. In general for posterior teeth the box form is best if there is extensive decay, while if the caries is in its incipiency the slice or combination slice and box may be used (fig. 2). In premolars it is advantageous in an MOD preparation to tip the palatal cusp, or even the buccal cusp as well. This is to prevent the not uncommon fracture which takes place after extensive restoration of these teeth (fig. 3).

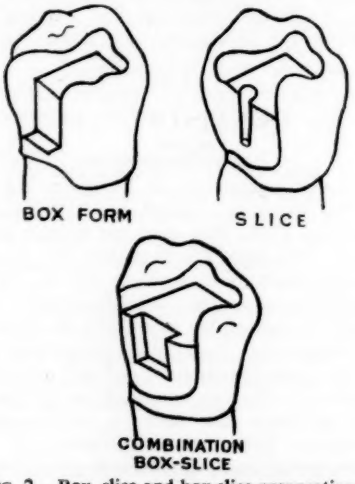


FIG. 2.—Box, slice and box-slice preparations.

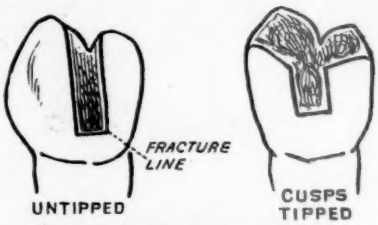


FIG. 3.—MOD cavity in premolar.

In anterior teeth the accepted form is the lingual dovetail preparation. A box-type cavity is cut in the carious area in correct inlay form, the deep caries removed and a cement lining inserted. The cavity is then extended on to the lingual surface in the form of a retentive lock. This lock should be in the thicker part of the tooth, usually near the cingulum, it should not be too near the incisal edge as this will weaken the tooth (fig. 4). However, there is a tendency nowadays to use the principle of incisal withdrawal instead of the lingual retentive lock.

FIG. 4.—Lingual dovetail.

The whole question of retention of gold inlays must be assessed for individual cases and a certain amount of ingenuity is sometimes called for. In general it is better to have a deep narrow lock rather than a shallow wide one, the depth will depend upon the position of the pulp, which may be found by first taking a radiograph. The retention should always be in the substance of the tooth and not in cement. In posterior teeth it is useful to extend the cavity buccally or palatally with a disc to form narrow retention grooves. This

form may also be employed in premolars where there is extensive caries and only two adjoining walls are standing. The groove is cut with a disc through the buccal or lingual wall between the remaining cusp and the other standing wall (fig. 5).

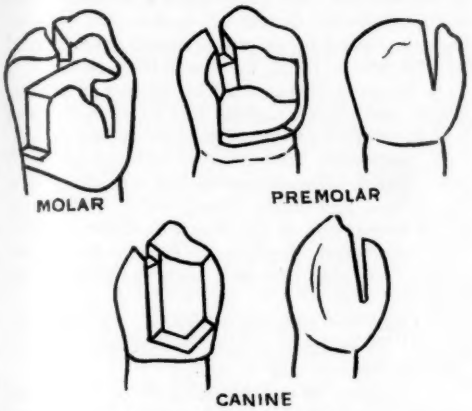


FIG. 5.—Retention extensions.

It is sometimes convenient to use this form in a lower canine for extra retention, although the strip of gold will show. If a considerable portion of the tooth is missing the use of pins may be indicated. It is useful to remember that a number 23 gauge platinum wire will fit exactly into a hole drilled by a quarter round bur. Two or even three small pins provide excellent retention.

### THE WAX PATTERN

The direct method of pattern taking is suitable for most average-sized cavities and all anterior teeth. The wax is softened, either in warm water or by slow rotation over a gas flame. The nearer the wax is to its melting point the less are the stresses and strains set up, but it should be noted that the wax should not be heated above this temperature. It is easy to do this if the wax is heated over a gas flame, and care must be taken to avoid it. The softened wax is formed into a cone and trimmed according to the shape of the cavity (fig. 6). The wax is forced into the cavity with direct positive pressure by the fingers and held for a short time before the patient closes the teeth on to the wax. The wax is cooled with a gentle water spray and the gross excess trimmed away with a wax carver. A length of cotton or silk thread is passed between the wax and the adjacent tooth, keeping to the wall of the sound tooth and away from the wax. A fine linen polishing strip is passed into the space made by the cotton. The strip should be just wider than the depth of the cavity. By moving the strip from the wax on to the tooth the edges of the pattern and the cervical margin may be trimmed interproximally, the whole being smoothed down with a straight or half-moon probe. The occlusal form is contoured with the various wax carvers and trimmers, and a beaver tail burnisher is useful for final trimming. The pattern should be cleaned with cotton-wool and warm water to give it a final gloss. In the more difficult cavities the use of a matrix band is indicated. The band is placed in position using a suitable holder, and the wax forced into the cavity. The band is removed and the pattern trimmed accordingly. Special care must be taken in fitting and contouring the band around the tooth. If the band is not contoured correctly the final contact point will be in the wrong place and food will be trapped interproximately. In both methods the contact point is removed from the pattern, and it may be added either direct to the wax or by soldering on to the final inlay. This addition should be as small as possible, it is not just adding extra gold to a poorly trimmed inlay. Each tooth has a specific point of contact and this should be studied before the wax pattern is taken (fig. 7). It is a common

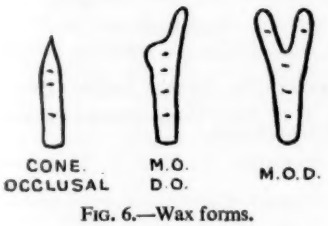


FIG. 6.—Wax forms.

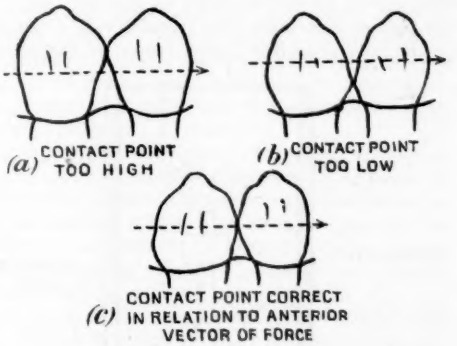


FIG. 7.

fallacy that a gold inlay should have a flange of wax on the pattern. The inlay extends to the edge of the preparation and should not go beyond this point. Distortion will easily occur as a result of over extending the wax beyond the edge of the cavity into undercut areas of the natural tooth (fig. 8).

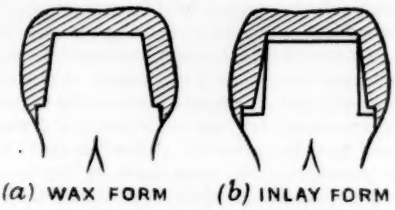


FIG. 8.—Effect of over extending wax.

### CASTING THE INLAY

If the sprue point is accessible the wax pattern is removed with the sprue, if not the inlay may be removed with a probe and sprued separately. The sprue should be tested on a piece of wax first to ensure that it is not too hot. The sprue must be placed so that all the wax is beyond the join of the wax to the sprue (fig. 9). Before investing a reservoir

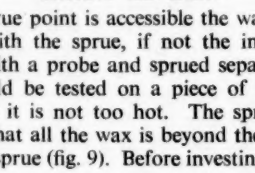


FIG. 9.—Position of sprug.

is added to the sprue very near to the inlay. This is to prevent shrinkage spots, i.e. porosity, for if the reservoir is not added the inlay in cooling shrinks and there will be no gold to make up this loss (fig. 10). The pattern is invested after painting with a surface tension lowerer such as Drene, Teepol, or turkey red

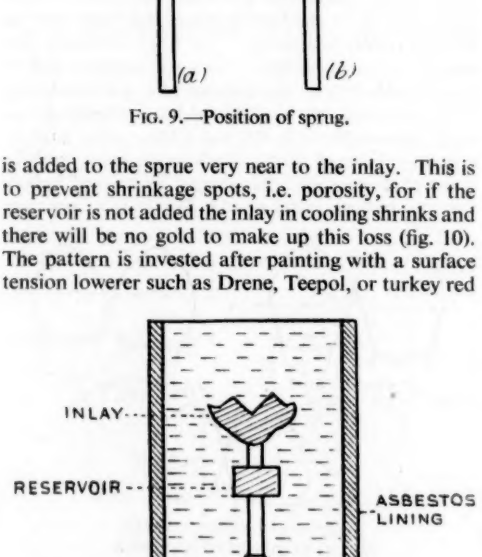


FIG. 10.—Inlay and reservoir in relation to casting ring.

oil. The most important point in investing is the elimination of air bubbles from the mixture. This is best achieved by the vacuumatic process.

The casting may be done by any recognised method and machine. The technique of casting is well understood and there should be few failures. However a number of factors will lead to bad castings. These are listed below and a careful inspection of the inlay should reveal the reason for a failure.

(1) Moisture in the mould at the time of casting. *Result.*—Incomplete casting due to back pressure from steam formed by hot gold on wet investment.

(2) Incomplete carbonisation or elimination of wax. *Result.*—Incomplete casting with shiny wax-like surface, and blurred rounded edges. Black or brown investment on the inlay with distinct odour.

(3) Insufficient pressure. *Result.*—Incomplete casting, one side cast well with blurring on the other.

(4) Gold not sufficiently molten. *Result.*—No casting. Tendency is usually to overheat the gold.

Rough castings may be caused :

(1) Primarily by overheated gold or overheated investment. (*a*) If the gold is overheated a coating of plaster clings to the final inlay which is very difficult to remove from the gold even with acid. (*b*) Overheated investment shows as feathers or fins on the inlay, the investment being easily removed.

(2) The lack of a reservoir, leading to porosity.

(3) By using a poor alloy, the gold having been recast too many times. This usually leads to a " rotten " gold sprue.

The final inlay should be trimmed as much as possible before it is tried in the tooth. The sprue is cut off and the inlay trimmed first with a stone and then with graded sandpaper discs, from rough down to smooth. Contouring is best done with a fine fissure bur (No. 1 or 2) in a straight handpiece. The inlay is tested in the tooth, the contact point added, and the inlay cemented in with a high-grade cement. Final polishing should be done twenty-four hours or more later. The better an inlay is made in the initial stages the less trimming and polishing there is to do afterwards.

From the operator's point of view there is probably more satisfaction in a perfect gold inlay than any other restoration, and for the patient it is the soundest and most nearly perfect.

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BRITISH DENTAL JOURNAL
DECEMBER 19, 1950

# THE COMMITTEE OF PUBLIC ACCOUNTS

Readers of the popular Press might be forgiven for thinking that the principal subject discussed by the Committee of Public Accounts[1] during their investigation of the cost of the General Dental Service was the dentist in Scotland who, with the help of one assistant and three mechanics, was reported to have earned gross fees of £18,000 in six months. This particular case did, in fact, give rise to a considerable number of questions to the representatives of the Ministry of Health and the Department of Health for Scotland regarding the methods adopted to check the work of individual dentists. These, incidentally, elicited the information that 219 out of some 3,000 patients of this dentist had been examined by an inspecting dental officer who had found that the denture work was "quite up to average" but that in some twelve cases conservative work had been "rather scamped." All this was of course "news," but to dwell on this single case would be to give a wholly false picture of the proceedings of the committee and of the reactions of both its members and the witnesses who appeared before them. Sir William Douglas, for instance, in answer to a question whether there was anything in the scheme to encourage the quality of the work, said they had to rely on the professional integrity of the dentist, adding: "In our experience since the appointed day our dentists at the Ministry and at the Dental Estimates Board would say that by and large the dentists in the country are doing good quality work." Sir William also made it clear that the relatively high gross earnings of dentists in the Service did not justify any criticism of the findings of the Spens Committee—as he put it "there has been such a demand at the doors of the dentists that the dentists *have had to do* (our italics) an extraordinary amount of additional work." He did, however, express the opinion that experience had shown that it was possible for a dentist to work more than 1,500 "chairside" hours per annum without undue detriment to his work, but he declined an invitation to say what figure he would suggest might be substituted for 1,500.

It is noticeable that throughout the long discussion which took place on this point very little reference was made to the possible long term effects on the profession of the continuous overstrain to which its members were being subjected. That this was so is understandable in view of the main concern of the committee. The point is, however, one which must be kept steadily in mind in all discussions relating to the remuneration of the profession, for it is manifestly important that this should be maintained at a level at which it is possible for the average conscientious practitioner to earn a reasonable income without overworking to such an extent as to jeopardise his health. Most men can work for long hours over short periods but it is only the exceptional man who can do so for any great length of time without detriment alike to his own health and both the quality and quantity of his output. And this is particularly true of a profession so exacting as that of dentistry. This danger was, indeed, recognised by Sir William Douglas who, after saying that some dentists had been able to sustain really "extraordinary high rates" apparently without serious detriment to the quality of their work, added that in other cases the quality did suffer and that this factor must always be borne in mind.

The relation of expenses to gross earnings in dental practice was the subject of a series of questions. These elicited some information as to the method which had been adopted by the Ministry of Health to obtain reliable figures which could be used to establish the average ratio of expenses to turnover. Briefly what has been done is that the Ministry of Health asked the Inland Revenue to select a block of dentists in each district and to make a statistical examination of their income tax returns in order to ascertain the expense ratio. The results of this examination will be communicated to the Ministry of Health as a statistical whole and the names of the dentists whose returns have been used will not be known to the Ministry or, indeed, to anyone outside the Inland Revenue.

[1] First, Third and Fourth Reports from the Committee of Public Accounts. H.M. Stationery Office. Price 15s.

The nature of the sample taken in this way will not depend, as have some previous samples of a similar kind, upon the willingness of individual dentists to supply the required information, since in this case individual dentists will have no knowledge whether their returns have or have not been included in the sample. It will be remembered that before negotiations with the Ministry were broken off, it had been agreed that some such procedure might be adopted. It is clear, however, that as the profession has not co-operated in this examination that they cannot be taken to be committed in any way to accepting the statistical results without previously subjecting them to independent expert examination.

A further question raised was whether, and if so to what extent, the ratio of expenses would tend to fall as turnover increased. That it would do so in some cases hardly seems open to question but it may well be doubted whether any generalisation of this kind would be applicable to more than a minority of practices. There is, for instance, a well defined stage in the development of a practice at which any further increase in the gross turnover is inevitably accompanied by a rise in the expense-ratio although this may only be of temporary duration.

We have touched upon only a few of the points raised in the proceedings of the Committee, but careful reading of the eight closely printed pages of evidence conveys a much clearer picture of the position and prospects of the profession in the Health Service than can possibly be obtained from other sources.

## NOTES AND COMMENTS

### Post-graduate Study

THREE booklets dealing with post-graduate study in dental surgery and the allied sciences have been issued by the Dental Post-graduate Bureau. The purpose of each of these is indicated by the titles "Facilities for Dental Post-graduate Study in the United Kingdom and Ireland," "Scholarships and Studentships for Advanced Studies and Research in Dentistry" and "Higher Dental Qualifications." The first of these contains a complete list of the schools and institutions at which post-graduate courses are held or which provide facilities for individual students. This is supplemented by an alphabetical list of subjects showing where instruction in each of them may be obtained. The list of scholarships which are available includes many open to British subjects and tenable abroad, for instance, in the United States or certain European countries. Particulars of these have hitherto been scattered in various publications and it is a great convenience to have them brought together under one cover. Copies of these booklets can be obtained on application to the Dental Post-graduate Bureau, 44, Hallam Street, London, W.1.

### Medical Films

IMPERIAL Chemical Industries Limited have just issued a catalogue of 16 mm. sound films which are available for showing to medical and dental audiences. These include ten films dealing with various aspects of anæsthesia, two being devoted to anæsthesia in the dental chair for adults and children respectively. These latter have been produced in collaboration with Guy's Hospital Dental School. Other films cover a wide range of subjects of which those on the movements of the tongue in speech, made in collaboration with the Department of Phonetics, University College, London, and the Middlesex Hospital, and one in three parts on the control of infection in surgical dressings, made in collaboration with the Birmingham Accident Hospital, will be of interest to the dental profession. The films are available free of charge for showing to professional audiences. Copies of the catalogue can be obtained on application to I.C.I. Film Library, Bolton House, Curzon Street, London, W.1, to whom all enquiries with respect to the films should be addressed.

### Pre-professional Education in Dentistry

THE Canadian Dental Association publishes the report of Thomas Cowling, M.A., D.D.S., B.Paed., Assistant Dean of the Faculty of Dentistry, University of Toronto, who was invited by the Association to study pre-professional dental education. His report will be of interest to all who are concerned with the training of dental students. Although only some fifty pages in length, it is a well thought-out survey covering the historical aspects, particularly as far as the United States of America and Canada are concerned, and with due attention to the practical problems affecting the Canadian schools. Among the latter is the fact that at present there is an unprecedented demand for admission to the dental schools and also limited teaching facilities and restricted accommodation. It is recommended that pre-professional training should extend over a period of two academic years "at the university level." This does not mean that it should necessarily take place at a university, since it is further recommended

that at least the second year should be under college or university auspices. Suggestions are made as to the timetable (which includes as subjects English, mathematics, biology, physics, inorganic and organic chemistry, and "electives") but latitude in detail is left to the schools and opportunities for daily independent study are specified. It is further recommended that consideration be given to the advisability of instituting aptitude tests immediately before enrolment for the professional course.

### Service Pay

THE increases in the pay of dental officers in the Services, recently announced by the Minister of Defence, will go some way towards meeting the claims of those officers to increases of pay comparable to those already granted to combatant officers. It is, however, doubtful whether they are on a sufficiently generous scale to have much, if any, effect on recruiting of regular officers for the dental branches of the Services. It will be noted that although the increases granted to medical and dental officers are the same, the basic pay of the latter remains 3s. a day below that of medical officers of corresponding rank.

## Fifty Years Ago

*From the "Journal of the British Dental Association," December 15, 1900.*

THAT promising and energetic offspring of the Association, the School Dentists' Society, has issued an annual report, which we publish on another page. It is gratifying to learn that the membership of this useful body now amounts to thirty-eight, it being noted that all of its members are actually engaged in school work. It is earnestly to be hoped that their recommendation to the Local Government Board, in regard to the equipment of dental officers, will have the effect of stimulating that body to a permanently active interest in the Society's work. Already we see signs from day to day that the necessity for the care of children's teeth is being more and more widely recognised, and as this recognition extends it cannot fail to have its due effect, not only directly on the comfort and happiness of the little ones themselves, but indirectly on the health of the community at large.

# LETTERS TO THE EDITOR

### VISUAL AIDS IN DENTAL EDUCATION

SIR,—The Dental Board has appointed a small committee to enquire into the position of visual aids in dentistry. The committee have viewed and appraised a number of films which have been made, either privately, by commercial firms or official bodies. We are anxious to get into touch with men who have made films of which we have no knowledge and would welcome any information from your readers on subjects of professional interest.

*Dental Board of the United Kingdom,*
*44, Hallam Street, London, W.1.*

Yours faithfully,
W. E. HERBERT,
*Chairman, Advisory Committee on Visual Education in Dentistry.*

### FILLING OF DECIDUOUS TEETH IN SCHOOL SERVICE

SIR,—In my previous letter published in the issue of November 21, I quoted from your review of a school dental report the words of your reviewer, "undoubtedly well organised"; and I drew attention to the absence in that review of any reference to the filling of deciduous teeth.

I am obliged to you for your small-type Editorial note which gives the important information that during the year under consideration, 19 fillings were inserted in deciduous teeth. This information can now be placed against the 20,672 temporary teeth extracted and the administration (for all extractions) of 17,714 general anæsthetics mentioned by your reviewer.

The distressing clinical picture disclosed must be heart-breaking to those who still remain loyal to the children in the face of great temptation, and would seem to call for more than your mild review. The words "undoubtedly well organised" are likely to act (unintentionally of course) as an opiate in non-dental quarters associated with these services. Complacency is likely to be encouraged thereby to the ultimate disadvantage of the school dental officer and dentistry.

14, *Belgrave Road,*
*Corstorphine.*

Yours faithfully,
THOS. H. J. DOUGLAS.

### THE DENTAL NURSE IN MALAYA

SIR,—I would like to ask for the courtesy of your columns to comment upon the article "The Dental Nurse in the Federation of Malaya," by Mr. C. F. Mummery, published in the *British Dental Journal* of October 3, 1950, **89**, 168. This scheme for dental nurses was introduced into the Federation of Malaya without prior consultation, in any way, with the dental profession in the Federation, or Singapore, or with other interested parties outside the Federation. I do not know whether any consultations took place with the administrative authorities in the Federation, or with the Director of Medical Services in the Federation, prior to, or contemporary with, the preliminary discussions referred to below. The scheme applies to the Federation and does not embrace the separate Colony of Singapore.

The scheme was set up under a clause in the Dentists' Registration Ordinance, which clause was inserted to make provision for certain conditions where dental treatment, out of necessity, had to be given by staff not specifically trained in dentistry or medicine. For example, in remote areas teeth might have to be extracted by dressers attached to a very small dispensary. This clause was exhaustively discussed. At no time in the preliminary discussions leading to the formulation of an agreed draft ordinance, for submission to the legislature, was there any suggestion made that this clause would be used to institute an entirely new scheme of dental service

in Malaya and to introduce a large new body of dental practitioners to provide an extensive amount of treatment usually performed by dentists.

The scheme has been introduced and is obviously going forward, and if it provides a better standard of dentistry for the Malayan population than is at present available, at a cost which is within the economic possibilities of Malaya, then the scheme should be regarded as one of benefit to the community as a whole and to which the profession, ethically, can hardly object. It remains to be seen whether this, in fact, will be so. One is perturbed at the manner in which the scheme has been introduced and the lack of control of the scheme in any way except by government officials, for the scheme is removed, completely, from the jurisdiction of the Dental Board of the Federation of Malaya. There is no indication as to the degree of supervision that is to be exercised on these dental nurses after they have completed their training nor on the eventual scope of their activities. All is entirely at the whim of the government.

To turn to the actual training scheme, it would seem that some of the advantages claimed are, in fact, fictitious. The fully qualified dental surgeon has a training of five years. The dental health nurse has a period of three years' training as a nurse, followed by two years' dental training, or five years of training in all, so that in point of time there is no difference in the length of the training of this lower grade of dental operator and the fully qualified dental surgeon. This is a fair comparison because the training of a dental surgeon involves a number of preliminary years of training before he comes on to his two final years of dental hospital practice. Thus, on the time factor for training, the dental nurses' scheme is of no advantage to the people of Malaya over that of training a fully qualified dental surgeon. In expenditure on subsequent salaries the dental nurse, who commands a much lower rate of salary than the dental surgeon, costs less. The difference is a direct reflection of the differences in standards of preliminary education, training and subsequent usefulness.

In Malaya there is a severe shortage of qualified dental surgeons. In Malaya there is also a severe shortage of nursing staff. There is a big wastage between the intake of probationers and the output of trained nurses. The dental nurse is then recruited out of the reduced end product, thereby further reducing the number of trained nurses for already understaffed hospitals and dispensaries.

Loss to the service by marriage and other causes is also likely to be large. It is unlikely to be less than in the New Zealand scheme in which wastage in the first five years of practice, after completion of training, is in the region of 44 per cent of each draft and by ten years becomes 67 per cent of each draft. This must be set against the very much smaller wastage over a similar period of trained dental surgeons and raises the actuarial cost of the dental nurse scheme out of all proportion to what superficially appears to be the annual cost.

Put another way : starting from scratch on an annual even output of dental nurses, a rapidly progressive number of each annual quota will be required to replace wastage so that the increase in those in the service proceeds ever more slowly. This can only be remedied by increasing the original intake and so the great snowball begins. In the case of the trained dental surgeon such wastage figures as are available suggest that it will take at least two and a half times longer to reach a similar wastage rate as dental nurses. Thus a direct comparison between the cost of training and salary of a dental nurse and a dental surgeon is quite misleading.

The actual course of training set out by Mr. Mummery requires some comment. In making these comments I am fully cognisant of the lay-out of the Dental Clinic in the Penang General Hospital and also of the staff available for teaching. I feel that I must take serious exception to the phrase that the " standard set is slightly below that of the L.D.S." I feel that Mr. Mummery has a very different idea of the present day L.D.S. standard than that which I have. For example, it is mentioned that the " trainees have already passed their Anatomy, Physiology, etc., in the general medical training." Surely Mr. Mummery does not imply that the " Anatomy, Physiology, etc.," taught to nurses is of anything like the same standard as that given to L.D.S. students. The preliminary minimum standard of education acceptable for entry to nursing precludes this in the majority of cases.

Towards the end of his article Mr. Mummery refers to an intake of twenty new trainees. I maintain that the training facilities available at Penang are inadequate for such a number, even at the level attained, and quite inadequate to train the nurses to a standard set " slightly below that of the L.D.S."

May I conclude by reiterating my earlier statement that if this scheme proves to be of greater benefit to the people of Malaya, and actuarially more economic than services of fully trained dental surgeons in equal numbers, then I for one would not oppose the principles behind the scheme, but I take leave to doubt that it will be so.

*University College Hospital Medical School, Mortimer Market, Tottenham Court Road, W.C.*1.

Yours faithfully,
E. K. TRATMAN.

## MANDIBULAR OSTEOTOMY

SIR,—It had been my intention to reply to the pertinent observations on mandibular osteotomy raised by correspondents in the August 4 Journal, after I was able to assess the question of relapse or otherwise in the case under discussion. However, the letter which appeared in a more recent Journal compels me to amplify the comments I made in my article.

Although relapse may occur where operation has been performed in early years it is most likely to do so in those cases of prognathism termed skeletal class III. Here, there is a strong and uninterrupted tendency to forward growth of the mandible, whereas in the cleft palate the prognathism is partly real and partly apparent. Other factors are also concerned in relapse and probably the most important are—the length of time and effectiveness of immobilisation, in this case eighteen weeks, and the ability of the occlusion to resist the forward movement of the mandible.

To my mind it is questionable whether the prognathic appearance of the cleft palate child is entirely due to the under-developed maxilla. It is likely, partly because of loss of vertical height of the maxilla, that a forward translation of the mandible occurs. If this is so, then the

contention that a spurious result has been obtained, because a normally positioned mandible has been reduced to articulate with an under-developed maxilla, is incorrect.

In regard to the under-development of the maxilla, it should be remembered that the arch deformity in unoperated cases is not as pronounced as in those cases where classical operation for closure has been performed in early years. In this respect, everything being equal, including speech, a good case could be made for delaying operation until a reasonable proportion of growth, especially in lateral width, has been achieved. As for repeated surgical assaults on the cleft, which may unfortunately occur in hands less skilled than those of your correspondent, these can only reduce to the minimum the chance of maxillary development at a time of its greatest growth potential.

Whilst the era of maxillary restoration may well be desired, surgical and dental practice might first consider if some of the deformities seen in the arch relationship of operated cleft palates do not fall into the category of preventable disorders.

31, *Portland Place*, *W.*1. Yours faithfully, T. CRADOCK HENRY.

## POLYMERISATION OF ACRYLIC DENTURE BASE MATERIALS

SIR,—In his remarks on our article on the polymerisation of acrylic denture base materials, Mr. A. O. Chick raises several points on which comment may be made.

Mr. Chick raises first, the point of the biological reaction of the material. Although no wide investigation of this matter has as yet been made, we have found amongst patients referred to this department in the last few months, two cases of extreme oral irritation in which the denture base material was found to have a mean molecular weight of a very low order. Although it is realised that two cases do not constitute evidence of great weight, yet it would at least point to the desirability of attaining a reasonably high degree of polymerisation.

The second question asked concerns " the resistance to wear " of the denture. It is somewhat difficult to see what Mr. Chick means by this term. It clearly does not refer to liability to fracture since this is mentioned subsequently under a separate head. The only interpretation that one may put on this phrase is that of abrasion resistance—a surprising criterion of the quality of a denture base material as distinct from that of a tooth material. If one's interpretation of this point is correct it may be readily shown that this property, as measured by the only readily applicable or standardised test—that of hardness—is quite dependent on the mean molecular weight. For material K we have :

| *Cure* | *Mean molecular weight* | *Brinell hardness* |
|---|---|---|
| 6 hours at 65° ... ... ... | 11,000 | 12 |
| 1 hour boil ... ... ... ... | 41,500 | 23 |
| 10 minutes vulcanised at 45 lbs. pressure ... ... ... ... | 47,000 | 25 |

Incidentally, we are well aware that hardness is not a perfectly satisfactory test for abrasion resistance but it is by far the best we have.

The third point raised by Mr. Chick, and indeed the whole burthen of his letter, is the question of the use of the tensile strength as the criterion of serviceability. Now, as Mr. Chick points out, it would seem highly probable that the causes of denture fracture are many and varied. It is also quite certain that liability to fracture is related to the structure and design of the denture. This is true of the failure in service of any engineering structure, be it a suspension bridge or a denture. Again, design factors apart, there may be several ways in which fracture may occur. Johnson and Matthews (*Brit. dent. J.*, 1949, **86**, 252) have discussed the possibility of fatigue fracture but it surely cannot be inferred that all, or even the majority of denture fracture takes place as a result of flexural fatigue. Surely the possibility must be included that fracture may take place in the mouth by, for instance, simple flexure in which case the tensile strength must be taken as the measure of resistance to fracture.

Mr. Chick points out that we have no grounds for believing that an increase in tensile strength is accompanied by an increase in flexural fatigue resistance. It must be pointed out that the work of Johnson and Matthews is concerned with different resins—no work has been as yet published on the relation between fatigue resistance, tensile strength and mean molecular weight in differently treated samples of the same resin. It may well be, as Mr. Chick suggests, that there is no relation between these factors, but one cannot surmise this. We hope to provide further evidence on this point soon.

In short if Mr. Chick can find one single cogent reason why the tensile stress-strain relationships should not be used as a criterion of serviceability of a material under the conditions of service in which they are normally applied, i.e. in cases of static or dynamic stress systems in which the fatigue factor is not involved, then we shall be pleased to look for some other factor as a criterion of serviceability.

*Turner Dental School*, *University of Manchester*. Yours faithfully, W. R. TYLDESLEY, E. MATTHEWS.

## ABSORPTION OR RESORPTION

SIR,—The use of the words " resorption " and " resorb " in recent examination papers prompted a reference to the Oxford English Dictionary which stated :

Resorb—to absorb again.

Resorption—the fact or process of re-absorption.

From this it would seem that the common use of the word " resorption " in connection with the loss of the roots of the deciduous teeth is quite wrong because the process is one of absorption and not re-absorption. Thus the older term of " absorption " is still correct—or perhaps someone may have other suggestions.

10, *The Oaks Avenue*, *Gipsy Hill*, *London, S.E.*19. Yours faithfully, RALPH COCKER.

## OCCLUSION AND ARTICULATION

SIR,—I agree with Mr. Chapman (*Brit. dent. J.*, Nov. 21, 1950, p. 230) that the definitions of the terms occlusion and articulation need clarifying.

The definition of occlusion put forward by the late Sir Norman Bennett would, I am sure, be improved if framed so as to lead explicitly to the interpretation which Mr. Chapman puts upon it, viz. " the relationship

of the maxilla and mandible, when the teeth are in closest contact, and the condyles are at rest in the glenoid fossæ."

The simple contact of the teeth in occlusion (as distinct from balanced occlusion to which I refer below) is achieved when the tips of the upper posterior teeth lock into the sulci of the lower teeth and vice versa.

This locking of the teeth, commencing with the bicuspids and ending with the molars, brings under consideration another term, " the occlusion plane."

This plane might be defined as the curved surface, extending backwards and upwards from the bicuspids to the molars, containing the representative points of contact of the upper and lower teeth, and which, if extended further, would pass through the temporomandibular joints. The curvature of the surface is that of the compensating curve of Spee.

In my latter days when demonstrating or writing on this aspect of prosthetic dentistry, I abandoned the use of the word articulation entirely and substituted the term balanced occlusion.

Balanced occlusion can be defined as the condition under which contact between the posterior teeth of the maxilla and mandible can be maintained on both sides of the mouth when the mandible is diverted to the right or left.

The teeth are rarely in contact during mastication, but the real advantage of a balanced occlusion set lies in the fact that the anterior teeth are prevented from coming into contact with one another during the sideways movements of the mandible, thus augmenting the value of the posterior teeth during mastication.

As regards the need for terms to be used in reference to what Mr. Chapman describes as " the normal rest position," it seems to me that the case would be met by calling this position the " relaxed position." The space between the maxilla and mandible could then be referred to as " the relaxed interdental space " (interdental is better than interstitial or freeway), and the corresponding separation of the posterior teeth as " the relaxed interdental distance." In my experience, for the proper enunciation of words, this distance should be approximately 5 mm.

Yours faithfully,

24, *Nursery Avenue*,
*Hale, Cheshire.*

J. MORTON.
(Late of Penrith.)

SIR,—Mr. Harold Chapman in his letter to the Journal has rightly drawn attention to the need for accurate definition of the term " occlusion " and for the avoidance of conflicting terminology in this rapidly advancing subject. It is doubtful whether the late Sir Norman Bennett's definition is adequate in the light of these advances.

The problem is, I believe, even more complex than Mr. Chapman suggests and it is important that terms should be evolved which not only have a definite meaning in dental practice, but also, which can be used to express scientific concepts.

There is a tendency to think that man is the only creature with an occlusion and I would make a plea, if new terms are to be introduced, for the consideration of the comparative aspect of the subject. Mr. Chapman considers that " centric occlusion " and " occlusion " are synonymous and certainly in the feline and possibly with the human dentition, there is justification for this point of view ; but in ruminants there are quite definite centric and right and left lateral occlusions, as well as excursions. This is, of course, a protective mechanism to ensure that the periodontal structures of groups of teeth of ruminants are not subjected to constant masticatory stress throughout the whole waking hours of their possessors ; and when, for example, in pecora the lower incisors impinge on the premaxillary pad in centric occlusion, then the premolars and the molars are not in occlusion. With the cud in one cheek and the cheek teeth coming into occlusion on that side, the cheek teeth on the opposite side and the incisors are then out of occlusion. Furthermore, there are three variants of normal centric occlusion in the sheep with a distribution related to the breed.

To many this may appear to be of mere academic interest, but we as a profession are the custodians not only of dental practice, but also of dental science. The study of occlusion in a scientific manner requires an accurate terminology, and I believe in formulating one, we must not only bear in mind, as Mr. Hamish Thomson has indicated, the significance of occlusion in every dental operation, but also that it may have relevance in many branches of mammalian zoology.

*Dundee Dental School*,
*Park Place*,
*Dundee.*

Yours faithfully,
A. D. HITCHIN.

### G.B.S. AND DENTISTRY

SIR,—When the great man came to me some years ago his first letter read as follows : " Dear Sir, I am ninety, toothless, and not very mobile. My lower plate has become uncomfortable and to some extent inefficient. I wonder could you improve on it. Probably my jaw has altered a little. I have your address from—etc., etc." He then gave the times he was free.

He was a charming patient and nothing was too good for him. On his third appointment he placed a cheque on my desk and said " put that in the bank quick I may be dead before I get them."

I still have his old dentures which I shall keep with his letters as a memento.

8, *Parkway*,
*Welwyn Garden City*,
*Hertfordshire.*

Yours faithfully,
S. A. PLEASANT.

## Reviews and Abstracts

**ORAL HYGIENE AND PREVENTIVE DENTISTRY.** First Edition. By Russell W. Bunting, D.D.Sc. Professor of Dentistry and Dean of the School of Dentistry University of Michigan and collaborators. London : Henry Kimpton. 1950. Pp. 240. Price 35s.

This book will fill a long-standing need for a textbook to take the place of the classic textbook on " Oral Hygiene " by Alfred Fones, which had become out of date.

In the author's words " the purpose of this text is to present the field of preventive dentistry and to state such related factual data as have been supported by adequate

scientific investigations." The book does precisely this, and will be of great value to those members of the medical and dental professions who believe that the keynote of all health service is prevention.

The book is divided into ten chapters, three contributed by Bunting and the remainder by seven well-known collaborators, specialists in their particular fields in the United States. The contents of the book naturally have a definite background of current dental thought in the United States, especially of the University of Michigan, but the facts presented are so clearly stated and factual that they can be applied wherever dentistry is taught and practised.

The underlying conception of this book is different from that of Alfred Fones. Fones produced his book to teach the hygienist, and to make the dental profession realise what she was being taught. Bunting has presented a book with the same title, but with a much broader conception, setting oral hygiene in its proper place in the picture of periodontal disease. This can only be an advanced textbook for teaching dental hygienists, for it is obviously assumed that the reader has a fundamental knowledge of anatomy, physiology and bacteriology, and understands the cellular structure of the dental tissues, how they live and function. Nevertheless it must occupy a very intimate place in the reference library of all teachers and workers in the field of oral hygiene and preventive dentistry.

Oral hygiene is treated throughout the book as a term used in its broadest sense to include all those conditions which contribute towards the health of the mouth.

Bunting himself has dealt with oral hygiene, the physiology of the mouth, organic and inorganic accretions on the teeth, and has also contributed a very interesting chapter dealing with the history, evolution, and status of the dental hygienist.

Donald Kerr, Associate Professor of Dentistry, University of Michigan, deals with the histology of the oral structures, and also presents a valuable chapter on traumatic occlusion, though the section dealing with the correction of traumatic occlusion is somewhat complicated and difficult to follow.

Professor Philip Jay, contributes a very valuable chapter on dental caries, bringing the reader up to date with current thought in the United States and his optimism that complete knowledge of the etiology of dental caries will be forthcoming is very inspiring. It is impossible to be impressed with the importance he attaches to the establishment of a service in dental schools and hospitals for lactobacilli counts in the saliva to determine susceptibility or otherwise to caries.

Professor Hamilton Robinson deals with periodontal disease. In this chapter inflammation is dealt with all too briefly but the system of classifying periodontal diseases on the basis of their underlying pathology seems to have great merit.

There is an interesting chapter on stomatitis by Professor Lester Burket, and Professor Lester Cahn contributes a chapter on oral and systemic disease in which the perspective of focal infection is put very clearly. This chapter should be read with advantage by most medical men and a great many dentists.

Dorothy Hard, Associate Professor of Dentistry, University of Michigan, deals with oral prophylaxis. The methods given for teaching instrument technique are valuable, though it is surprising to find no mention made of the door-handle for elementary training in grasps and movement. This chapter is of great value to the dental hygienist from a vocational point of view.

The print and quality of the paper are good, there are 138 illustrations, many of which would have been very much more informative had they been in colour.

**PRESCRIPTION WRITING AND MATERIA MEDICA FOR DENTISTS.** Third enlarged Edition. By L. Richard Cipes, Ph.G., D.D.S. Dental Items of Interest Publishing Co., Inc. 530 Pages. Price 63s.

The author is very strongly of the opinion that dental surgeons should not prescribe well advertised proprietary preparations, but should prescribe for each individual from their own fund of clinical and pharmacological knowledge. In the preface of his work he gives very cogent reasons for this view. The book deals fully with the great advances of the last fifteen years, with which it has been so difficult for practitioners to keep up to date. The use of the sulphonamide group of drugs in relation to their use in dentistry is very adequately dealt with. The chapter on penicillin therapy and the more recent antibiotics is extremely interesting, as it deals with the discovery of the agent and its subsequent employment in its numerous preparations, with much wise advice as to their use.

The vitamins are considered fully in their relationship to dentistry, and those who prescribe them freely would do well to think carefully over the advice given by Dr. Cipes on the subject.

Fluorine therapy is discussed and various methods of carrying out medication with this substance are described.

These are but brief remarks on a book which covers every aspect of pharmacology which is likely to concern the dental surgeon.

The book should certainly be widely studied by the profession.

**South African Fossil Hominoids.**—Professor le Gros Clark has repeated his previous examination of 50 immature chimpanzee skulls and confirmed that the milk canine in this series presents a morphological pattern very different from that of the fossil Australopithecinæ found at Taungs and Kromdraai. In addition, he claims that, despite arguments to the contrary by Professor Zuckerman, the metrical data relating to overall height, length and width of the australopithecine milk dentition does show a statistically significant difference when compared with that of the anthropoid apes. When the permanent dentitions of the two are examined, again there is the same contrast to be found. Consideration of these differences along with further discoveries of other parts of the skeletons of Australopithecinæ, leads Professor le Gros Clark to conclude that : " In the totality of their morphological features, the Australopithecinæ certainly resemble primitive hominids much more closely than do any of the known anthropoid apes."—W. E. Le Gros Clark (1950) *Nature Lond.*, **166,** 758 and 791.

**Congenital Anomalies of the Floor of the Mouth and Mandible.**—Two cases are reported, both considered rare. The first, a 16-day-old baby, showed an inverted lower lip held down by a band of soft tissue composed of skin and mucous membrane extending posteriorly along the top of a bony arch in the floor of the mouth which was divided into two compartments by this bone. The normal tongue lay in the larger compartment, the tongue lying in the oropharynx with its tip pointing upwards. In the other compartment were three freely movable masses of tissue, two of which were supernumerary tongues. The mass of bone and the supernumerary tongues were removed. The mass of bone contained two deciduous molar germs. At a second operation the band of tissue holding down the lower lip was removed and the lip contoured. A third operation at 21 months was performed to remove the middle body of bone—as soon as this was effected the tongue assumed its normal position. Three hours later the baby died from rupture of the stomach from acute dilatation due to the nasal catheter, used in anæsthetising the child, being too close to the œsophagus and ether reaching the stomach. The second case was a child with atresia of the left maxillary duct. There was a cystic swelling over the duct. A 20 gauge silver wire pointed at one end and bent into the shape of the figure 6 was introduced into the dome of the cyst. The pointed end emerged from the anterior surface, this was cut off and removed leaving the two ends, which were bent together, in the cyst; this provided two escapes for saliva. The cyst emptied itself. Six weeks later, the lumens of the duct having epithelialised, the silver ring was removed, permitting a free flow of saliva.—S. B. FONTAINE (1950) *J. Oral Surg.*, **8**, 331.

**Upper Third Molar in the Cheek.**—An attempted removal of an impacted upper third molar resulted in loss of the tooth into the cheek and difficulty in locating it by radiograph. The tooth was located by a large ethmoid spoon curette three times before it was removed. After it had been removed a portion of the protruding buccal pad of fat was removed and the remainder tucked back into the cheek. There was œdema and muscular trismus of the jaw but the recovery was otherwise uneventful.—S. EVERSON (1950) *Dent. Items*, **72**, 1029.

# THE HEALTH SERVICE

## NOTES FROM HEADQUARTERS

### From our Special Correspondent

FROM enquiries received by the Health Acts Department it would appear that there is some confusion regarding the new regulations (S.I. 1950/1682) which came into force on November 1, and which relate to emergency treatment. In particular, the dentist's obligations regarding the examination of his patient seem to be misunderstood.

Under the old regulations a dentist could carry out a very limited amount of emergency treatment for a patient namely two extractions or a dressing, and make use of Form E.C.17A. If the dentist had to visit the patient, in order to carry out this emergency treatment, or if he was called upon to arrest hæmorrhage for a casual patient, then he had to make use of Form E.C.17. Once a Form E.C.17 was brought into use, then the dentist immediately became under an obligation (*a*) to make a complete detailed examination and charting of the patient's mouth (obviously almost a physical impossibility in a hæmorrhage case), and (*b*) to carry out all the treatment necessary to render the patient dentally fit. In actual practice, the Ministry has not insisted that the dentist shall fulfil these obligations when a Form E.C.17 has been used in these circumstances, and this position has now been regularised under the new regulations.

The profession finds it difficult to understand how it is that while the new regulations expressly provide that a fee for clinical examination and report is not payable when a Form E.C.17 is used for an emergency case, yet the dentist is still expected to certify that he has examined the patient. Surely the circumstances and extent of the examination are quite different. When taking on a new patient, before a dentist can claim a fee for examination *and report* he has to do the following : Complete the chart in part 7 to show the missing teeth and (having examined each tooth carefully) the position of any cavities ; complete column 1 of part 8 to show his complete diagnosis of the whole mouth (including choice of filling materials, anæsthetics, style, type and material of dentures, etc.) ; explain this treatment to the patient, and find out how much of it the patient is willing to undergo ; and then possibly complete column 11 of part 8 to show how much treatment the patient is willing to have. It should be noted that the Penman Committee reported that such an examination took on the average 16 minutes.

On the other hand, the new regulations, while they require a dentist to certify that he has examined his patient, do not lay down any standard of that examination, except to say that a dentist need not complete the normal charting in part 7, nor need he diagnose the whole case, since he only has to enter in part 8 the treatment actually carried out to meet the emergency. It is indeed difficult to imagine how a dentist can carry out any sort of treatment for a patient without some examination of the mouth. A dentist who says to a casual patient " I think that your immediate trouble is caused by a lower left molar. In addition, at a quick examination I can see at least three other teeth that should come out, you have several teeth that need filling, your gums are in poor condition, and you will probably need a partial denture. I am much too busy at the moment to take you on as a patient to do all this work, so I propose to get rid of the tooth that is causing your pain, but I advise you to get the other work done as soon as you can " is surely doing his duty to his patient, and is certainly complying with the new regulations.

As regards repairs to dentures, the position of both the patient and dentist has been very much improved by the new regulations. A dentist always had to use Form E.C.17 for denture repairs, and consequently was under an obligation to make a complete examination and charting of the patient's mouth, and to take on the patient for any other necessary work as well. If he did not do these things, he was in breach of his terms of service. On the other hand, the Ministry were receiving complaints from patients that they were unable to get repairs done in an emergency for the very reason that

dentists were not willing to risk committing this breach in their terms of service by only doing the required repair. By removing these two obligations on the dentist, the new regulations should enable patients to get their dentures repaired in an emergency more easily. There only remains the difficulty of repairs that are sent by post, or brought by a third party and this point is at present the subject of discussion with the Ministry.

# DENTAL NEWS

## DURHAM COUNTY COUNCIL

THE position of the Government in relation to the action of Durham County Council in attempting to enforce membership of a trade union or a professional organisation upon members of their staff was laid down by Mr. H. Morrison in answer to Questions in the House of Commons on December 5. He said that the County Council had been informed that the Government strongly deprecated the Council's proposal to make membership of an association or union a condition of service. The Government or individual Ministers had no authority to take further action unless and until approval, where such approval was necessary, was sought to the termination of some appointment, or there was a breakdown, a threat of breakdown, in services for which the council had statutory responsibility, in which event Ministries concerned had powers to intervene in order to secure the proper maintenance of the service, and would, if necessary, do so.

Asked by Dr. Hill whether his reply meant that in the event of a dismissal of any officer the Government would vigorously intervene, Mr. Morrison said he thought that if it got to the point of operative action in that direction, Dr. Hill was entitled to assume that the Government would take serious notice of that situation.

The British Dental Association have made it clear, in statements issued to the Press, that they take the strongest possible objection to it being made a condition of employment of any dentist that he should belong to a professional organisation, and that advertisements for dental officers submitted by authorities seeking to impose such a condition will not be accepted for publication in the Journal. Should the Council seek to dismiss any dental officer it seems certain that the Minister of Education would feel compelled to intervene in order to avert a further decline in the available facilities for the treatment of school children.

## SCHOOL DENTAL SERVICE

### Questions in Parliament

**Norfolk.**—In reply to a question by Mr. Dye (Norfolk) the Minister of Education said that five school dentists were at work in Norfolk at the moment, and that nearly half the school population of the area were receiving regular dental inspection and treatment. Emergency treatment was available for the greater part of the other half and where possible attempts were being made to increase it.

The Minister was then asked whether there had been any response in Norfolk or elsewhere to the circular sent out two or three months ago from the British Dental Association urging local groups of dentists to take part in this work on a part-time basis. The Minister replied that there had been some response but that he could not, without notice, state to what extent.

**Northants.**—In a written reply to a question by Mr. Mitchison (Kettering) the Minister of Education said that the local education authority for Northants had approved the establishment of seven dental officers and that they at present had five. The only way to remedy the present deficiencies of the school dental service was to have more school dentists and he hoped that the present negotiations on the Dental Whitley Council would result in a satisfactory settlement which would subsequently improve the position.

## ERASURE FROM THE REGISTER

THE General Medical Council, acting on a finding of the Dental Board, have ordered the name of Mr. Charles Dentith Vickers, of Hounslow, to be erased from the Dentists Register. He had been found to have demanded and received sums of money from patients in respect of treatment which he had undertaken to provide under the National Health Service Act. He was further found wrongfully, since 1937, to have included the name of Ernest Henry Green, a registered dentist in the list of directors of H: Coplan and C. Dentith Vickers Limited, a company carrying on the practice of dentistry, in order that the company might continue to carry on that business although in fact Mr. Green was not during that time a director of the company.

## CONFERENCE OF DENTAL LABORATORIES

THE Annual Conference of the Dental Laboratories Section of S.I.M.A. is to be held at The Holborn Restaurant, W.C.1. on Saturday February 10, 1951, at 10.30 a.m. At 2 30 p.m. there is to be a series of Table Demonstrations given by members of the area branches of the Dental Laboratories Section. Admission is by invitation obtainable on application to any member of the D.L.S. of S.I.M.A.

# The Services

**Medical and Dental Officers' Pay.**—In a written reply on November 29, the Minister of Defence announced that increases in pay had been approved for medical and dental officers of the three Services. In addition there would be increases in specialised pay for medical and dental specialists in the Royal Navy and Army. In the R.A.F. specialist qualifications would continue to be recognised by a system of accelerated promotion. The increased rates would not apply to National Service Officers until they had completed eighteen months' whole-time service. The increases and new rates for dental officers which would take effect from September 1, 1950, were as follows :

BASIC PAY

| *Rank* (*Only Army ranks shown*) | *Increases Daily* | *New Rates Annual* |
|---|---|---|
| | s. d. | £ |
| Lieutenant... ... ... ... | 4 6 | 447 |
| Captain : | | |
| Under 3 years ... ... | 4 6 | 538 to 593 |
| After 3 years ... ... | 7 0 | 639 to 748 |
| Major ... ... ... ... | 7 0 | 858 to 1,022 |
| Lieutenant-Colonel ... ... | 8 0 | 1,150 to 1,369 |
| Colonel ... ... ... ... | 10 0 | 1,497 to 1,661 |
| Brigadier ... ... ... ... | 10 0 | 1,716 |
| Major-General ... ... ... | 10 0 | 2,190 |

SPECIALIST PAY

| | *Royal Navy* | | *Army* | |
|---|---|---|---|---|
| | *Increase* | *New Daily Rates* | *Increase* | *New Daily Rates* |
| Graded Specialist... | — | 5s. | — | 4s. |
| Full Specialist ... | 3s. a day | 8s. | 4s. a day | 8s. |

# Personalia

**Golden Wedding.**—Mr. E. W. A. Jeffrey, L.D.S.Edin., 28, Havelock Road, Southsea, a life member of the British Dental Association, celebrated his golden wedding on December 6, 1950.

## The Schools

**University of London.**—Miss K. Corisande Smyth, F.D.S. R.C.S.Eng., has been appointed to the Readership in Orthodontics, tenable at the Royal Dental Hospital of London School of Dental Surgery.

**University of Birmingham.**—Mr. R. F. Pusey, B.D.S., L.R.C.P., M.R.C.S. has been appointed Clinical Lecturer in Dental Surgery.

**The Royal Dental Hospital 34th Annual Clinical "At Home."**—Royal Dental Hospital "At Homes" are annual functions that are looked forward to and attended by many others besides old students. At this year's "At Home" there was the usual display of clinical cases and of the work of the various departments including several chairside demonstrations of conservative techniques and minor oral surgery. One of the most valuable and interesting demonstrations was a table display illustrating the causes of malocclusion with special reference to the influence of malocclusion upon parodontal disease and its treatment. The feature of the "At Home" which aroused the most interest, and which was generally agreed to be a great success, was the Brains Trust session held in the Lecture Theatre. The questions were answered ably and with much wit by Messrs. N. J. Ainsworth, B. W. Fickling, J. H. Hovell, and H. M. Pickard. The proceedings were presided over by the Question-Master, Dr. A. B. MacGregor.

## Obituary

### DR. MENDEL NEVIN

Dr. MENDEL NEVIN, President of the Novocol Mfg. Co., Inc., died of a heart attack on Wednesday, November 8, in Chicago, where he was attending a convention. He was 69 years old.

Dr. Nevin graduated from New York University Dental School in 1907. After a period spent in the active practice of dentistry, during which he held a number of hospital appointments, he established the Novocol Chemical Manufacturing Co., Inc., to make the local anæsthetic formulas which he had developed.

In addition to writing, "Conduction, Infiltration and General Anæsthesia in Dentistry," he was the owner and general manager of *Dental Items of Interest*, the oldest monthly dental journal in the world, and editor of *Modern Dentistry*.

Dr. Nevin was a pioneer in the teaching of local anæsthesia and its administration and the first motion picture on a specialty of dentistry was made under his supervision and direction as far back as 1917. This dealt with his techniques of the then new methods of nerve blocking. Subsequently he produced colour and sound motion pictures for the teaching of local anæsthesia injection technique.

Through the Novocol Chemical Mfg. Co. he made many grants to schools, clinics and hospitals for dental research. In an address to the 100th Anniversary Celebration of the Birth of Anæsthesia at the Massachusetts General Hospital in 1946, Dr. Kurt A. Thoma said, "Through a research grant made by Dr. Mendel Nevin, President of the Novocol Chemical Mfg. Co., it was possible to rebuild and re-equip the dental clinic at the Massachusetts General Hospital. I want to make use of this occasion to thank Dr. Nevin for his generosity."

**Henry Havelock Martin, L.D.S.Edin.**, of Belfast, died on November 22, 1950, aged 76. He qualified from Edinburgh Dental School in 1901 and practised in Belfast until he retired in 1935. He was a past-president of the North of Ireland Branch of the Association.

**Benjamin Horbury Walker**, of Rochdale, died on November 25 at the age of 62. He had practised in Rochdale for some 27 years. A keen Freemason he was a past provincial officer and had held prominent offices in the Mark Masonry.

*The Charge for Announcements of Births, Marriages and Deaths is 2s. 6d. per Line. (Approximately 8 words.) Minimum 7s. 6d.*

### Marriage

**MACKIE—MILLER.**—On December 1, 1950, at Malborough House, Glasgow, by the Reverend William Birrell, M.A., George Campbell Mackie, M.R.C.V.S., to Isabel Coulter Miller, L.D.S. Glasg.

### Death

**CELLAN-JONES.**—On Friday, December 1, Alan Cellan-Jones, M.B., B.S., D.D.S., L.D.S., of 296, West End Lane, Hampstead, London, N.W.1.

## Our Diary

*Wednesday, December 20.*

**East of Scotland Branch.**—Annual Meeting, B.M.A. House, 7, Drumsheugh Gardens, Edinburgh, 8 p.m., preceded by Council, 7 p.m. Address on the proposed General Dental Services Committee.

**Hounslow and Twickenham Section.**—Dinner Meeting, "Jolly Gardeners," Isleworth, 7 p.m. "Observations on my American Visit," R. G. Swiss. Members and guests, including ladies, welcomed.

**Metropolitan Branch—Southern Section.**—Christmas Luncheon Meeting, Wavertree Restaurant, Streatham Hill, S.W.2, 12.45 for 1.0 p.m. Ladies specially invited. Members intending to be present please notify Hon. Sec., N. H. Knowles, BALham 4117.

*Thursday, December 21.*

**Scottish Committee.**—Station Hotel, Perth, 2 p.m.

*Wednesday, January 3.*

**Central Counties Branch.**—Luncheon Meeting, Midland Hotel, Birmingham, 1 p.m. Colour Films: "Bite Recording for the Edentulous Patient," (commentary by Professor J. Osborne); "Apicectomy" (commentary by J. L. Hardwick).

*Monday, January 8.*

**Metropolitan Branch—Finchley Sub-Section.**—Annual Dinner, Salisbury Hotel, Barnet, 6.30 p.m.

*Tuesday, January 9.*

**Bristol and District Section.**—Dental Hospital, Bristol, 7.30 p.m. "Legal and Ethical Aspects of Dental Practice," Dr. A. R. French.

*Thursday, January 11.*

**Brighton and District Section.**—The Dudley Hotel, Lansdowne Place, Hove, 8 p.m. "The Treatment of the Fractured Incisor," A. Maxwell Horsnell.

**Northern Counties Branch.**—Sutherland Dental School, Northumberland Road, Newcastle-on-Tyne. Council, 5 p.m. Branch meeting, 6 p.m. "Current Affairs," A. H. Condry.

**West Lancashire, West Cheshire and North Wales Branch.**—Exchange Hotel, Liverpool, 7.30 p.m. "The General Dental Services Committee," T. Hindle.

*Thursday, January 18.*

**Bournemouth and District Section.**—Grand Hotel, Fir Vale Road, Bournemouth, 8 p.m., preceded by Informal Dinner, 6.30 for 7 p.m. "Dental Photography," J. M. Dyce.

**Central Counties Branch.**—Clinical Meeting, Medical Institute, Birmingham, 7 p.m.

**Leeds and District Section.**—Leeds School of Dentistry, 7.45 p.m. "An Impression Technique for Full Lower Dentures," Professor H. B. Fenn.

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